

**UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION**

**SHELL GLOBAL SOLUTIONS (US)
INC., and SHELL OIL COMPANY,**

Plaintiffs,

V.

RMS ENGINEERING, INC., TESORO CORPORATION, and TESORO REFINING AND MARKETING COMPANY,

Defendants.

CIVIL ACTION NO. 4:09-cv-3778

MEMORANDUM AND ORDER

In this patent infringement suit, the Court is asked to construe the asserted claims of U.S. Patent No. 6,221,318 (the “318 Patent”). A hearing was held on December 1, 2010, during which the parties presented argument in support of their proposed constructions. This Court now construes the disputed claim terms as a matter of law under *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995), *aff’d*, 517 U.S. 370 (1996).

In addition, pending before the Court are Defendants’ Motion for Summary Judgment on Equitable Estoppel and Laches (Doc. No. 58), Defendants’ Motion for Summary Judgment on Indefiniteness (Doc. No. 50), and Defendants’ Motion to Exclude Expert Testimony of Ye-Mon Chen (Doc. No. 87).¹ Upon considering the Motions, all responses thereto, and the applicable law, the Court finds that the Motion for Summary Judgment on Equitable Estoppel and Laches (Doc. No. 58) should be denied, the Motion for Summary Judgment on Indefiniteness (Doc. No.

1 Also pending before the Court are Defendants' Motion for Summary Judgment on Anticipation (Doc. No. 48) and Defendant Tesoro Refining and Marketing Company's Motion to Compel (Doc. No. 52). On November 8, 2010, the Court granted Plaintiffs' Motion for Extension of Time to respond to the Motion for Summary Judgment on Anticipation until after this *Markman* order was issued. The Court will issue a separate order regarding the Motion to Compel.

50) should be denied, and the Motion to Exclude Expert Testimony of Ye-Mon Chen (Doc. No. 87) should be denied as moot.

I. BACKGROUND

A. Technological Background

This patent infringement case involves a device known as a spent catalyst distributor, which functions within the fluid catalytic cracking unit (“FCC Unit”) of an oil refinery. Refineries convert heavy crude oil, which cannot be directly used, into lighter products such as gasoline and diesel. Refineries use a process called “fluid catalytic cracking” (“FCC”) in order to perform this conversion. The FCC process takes place within the FCC Unit. The FCC Unit consists of two vessels—a reactor and a regenerator. Within the reactor, two streams of material are introduced: (1) liquid hydrocarbon feedstock (i.e. the crude oil); and (2) catalyst material that comes from the regenerator. The catalyst is made up of fine particles that are “fluidized” (meaning that the particles act like a liquid when lifted up or diffused by gas). Inside the reactor, the hydrocarbon is “cracked”—so called because the large hydrocarbon molecules constituting the heavy fractions are broken up into smaller molecules—by the presence of heat and the active catalyst. As the cracking process occurs, the heavy carbonaceous material or a “coke layer” deposits itself onto the catalyst, which is subsequently termed “spent catalyst.” The lighter hydrocarbon molecules are separated from the spent catalyst via cyclones and siphoned off into a separate “product recovery system.” The spent catalyst leaves the reactor via a “spent catalyst transfer line” and enters the regenerator through an “inlet conduit” and “spent catalyst distributor.” The spent catalyst distributor is the subject of Plaintiffs’ 318 patent. The spent catalyst distributor distributes the spent catalyst among heated air (which comes into the regenerator via an “air distributor”) so that the spent catalyst is once again “fluidized.” The

heated air burns the carbon or coke off of the catalyst, thereby rendering the catalyst usable again. The regenerated catalyst leaves the regenerator by way of a “withdrawal well” or “hopper,” which takes the regenerated catalyst back to the reactor. The FCC process repeats itself. The continuous flow of catalyst between the reactor and generator allows the continuous processing of crude oil.

Shell Global Solutions (US), Inc. and Shell Oil Company (collectively, “Plaintiffs” or “Shell”) own the 318 Patent, which teaches a process and apparatus for distributing fluids in a container. Shell has alleged that the spent catalyst distributor installed during renovation of the FCC Unit in the Salt Lake City refinery (the “SLC Refinery”) of Tesoro Corporation and Tesoro Refining and Marketing Company (collectively, “Tesoro”) infringes claims 1-4 of the 318 Patent. RMS Engineering, Inc. (“RMS”) acted as a consultant to Tesoro during the renovation and installation process of the FCC Unit at the SLC Refinery. Tesoro and RMS (collectively, “Defendants”) have filed summary judgment motions asserting defenses of equitable estoppel, laches, indefiniteness, and anticipation. The parties now seek to construe certain terms contained in the patent-in-suit, as well as rulings on the summary judgment motions regarding equitable estoppel, laches, and indefiniteness.

B. Factual History

Shell and Tesoro have had an extensive and ongoing business relationship. In 1998, Shell sold its Anacortes, Washington refinery to Tesoro. (Baebler Decl. ¶ 4.) At the same time, Shell’s FCC expert, David Brosten, left Shell to join Tesoro as Tesoro’s FCC specialist. (*Id.*) During his employment with Tesoro, Brosten worked with Reza Sadeghbeigi, owner and president of RMS, in connection with the modification and repairs made to Tesoro’s refinery in Mandan, North Dakota. (*Id.*) In 2003, Brosten left Tesoro to rejoin Shell. (*Id.*)

In turn, RMS has had an extensive and ongoing business relationship with Shell. Sadeghbeigi worked with Shell on the revamp of the FCC Unit at the Premcor refinery in Port Arthur, Texas. (Sadeghbeigi Decl. ¶ 4.) He worked with Shell employees to obtain bids for Tesoro's SLC Refinery revamp and a revamp of a FCC Unit in the Irving Oil Refinery in Canada. (*Id.*) Sadeghbeigi routinely corresponded with Brosten about proposed designs and projects, and in January 2004, provided Brosten with information about consultants and industry contacts for Shell's business development. (Sadeghbeigi Decl. ¶ 3; Brosten Decl. ¶ 3; Doc. No. 58, Ex. 6; Doc. No. 58, Ex. 7.) In 2007, RMS was retained by the Lyondell refinery to evaluate the performance of its newly renovated FCC Unit, which used Shell technologies. (*Id.* ¶ 6.) As part of the evaluation, Sadeghbeigi discussed the Lyondell operations extensively with Brosten. (*Id.* ¶ 6.) RMS regularly conducts training seminars that Shell employees attend. (*Id.* ¶¶ 3, 5; Doc. No. 58, Ex. 9)

In 2004, Tesoro began the process of gathering bids for the 2007 revamp of the FCC Unit in its SLC Refinery. (Baebler Decl. ¶ 8.) The FCC Unit has been originally built in 1944. (Baebler Decl. ¶ 6.) Over the years, the FCC Unit had utilized several types of spent catalyst distributors. (*Id.* ¶ 7.) Around 1980, Tesoro modified the spent catalyst distributor to use a design that had a central riser with three fluid conveying arms extending outwardly and sloping downwardly at an angle of 30° from horizontal (the "1980 Design"). (*Id.*) The revamp involved the replacement of several devices within the FCC Unit, including the spent catalyst distributor, the standpipe, and the withdrawal well. (*Id.* ¶ 9.) Tesoro selected RMS to oversee the revamp of the regenerator of the FCC Unit. (Sadeghbeigi Decl. ¶ 7.)

In August 2004, Sadeghbeigi sent a Request for Quotation ("RFQ") to various vendors, including Shell's development partner Foster Wheeler and Brosten. (Baebler Decl. ¶ 11;

Sadeghbeigi Decl. ¶ 10; Doc. No. 58, Ex. 10.) The RFQ requested proposals to modify several devices within the FCC Unit, but did not request a proposal for the revamp or modification of the spent catalyst distributor. (Doc. No. 58, Ex. 11 at 3, 5; Chen Decl. ¶ 7.) The RFQ did disclose the then-current design of the FCC Unit, including the 1980 Design spent catalyst distributor. (Sadeghbeigi Decl. ¶ 10; Doc. No. 58, Ex. 11.) The RFQ described the spent catalyst distributor as follows: “The spent catalyst enters the regenerator through a center hub having three (3) 22.5” ID distributor arms. These distributor arms are pointed downward at 30° from horizontal.” (Doc. No. 58, Ex. 11 at 10.)

On August 24, 2004, Brosten emailed Ye Mon Chen, Shell’s Fluid Catalytic Cracking Manager and Technology Licensing Manager in the American Region, about the RFQ. (Chen Decl. ¶ 2.) Brosten stated that Sadeghbeigi appeared to be using the “Shell CCET in his draw off-well design.” (Doc. No. 58, Ex. 15.) Brosten believed that the design was covered by Shell’s patents and asked Chen’s advice on how to proceed. (*Id.*)

On August 31, 2004, Rien Elfring, a Shell employee, spoke with Matthew Baebler, Director for Energy Excellence at Tesoro, about the revamp of the FCC Unit. (Baebler Decl. ¶ 11.) Elfring explained that he was concerned that the technical solution relating to the standpipe and withdrawal well contained in the RFQ might infringe upon one or more of Shell’s patents relating to standpipe and withdrawal well technologies. (*Id.*) Baebler told Elfring that the issue would be “cleared up” before Tesoro continued with the proposal and that Tesoro desired to have an “open art approach” to technology. (*Id.*) Elfring subsequently emailed several Shell employees, including Chen, about his conversation with Baebler. (Doc. No. 58, Ex. 16.) Elfring stated that he had explained to Baebler that “[Shell] suspect[s] the technical solution as developped [sic] by RMS for their revamp possibly infringes one or more of our patents. . . I

explained that as long as this is not resolved we, and Foster Wheeler, will decline to bid on the ITB as received from RMS.” (*Id.*) Elfring noted with concern that Tesoro had expressed its belief that, rather than licensing technology from a company like Shell, it hired RMS to “pick the best of all available technologies that are, or have become, open art.” (*Id.*) Elfring stated that it would be a “dangerous development for licensors if more companies start to believe this. All the more reason to make a fuss about this, and limit to open art playing field.” (*Id.*) Chen emailed the following response:

Very good insight and indeed this the thinking of Tesoro (and other mid-size refining companies). RMS is a major threat to us to destroy the licensing business because they operate under different rules (they don’t follow any) and they are cheap. . . .

We need to keep in mind that Teroso is on RMS side, not ours. According to Dave Brosten, RMS has involved in all Teroso revamp playing the same role. When we play hard ball with RMS, be prepare how Teroso reacts. Teroso still think that if Shell GS declines to bid, no big deal. They think that they could go to S&W for the same solution, which they will find out not quite the case.

(*Id.*) That same day, Foster Wheeler wrote to Sadeghbeigi to inform him that it declined to bid on the RFQ and to “bring to [his] attention” two patents: U.S. Patent 6,228,328 B1 (the “328 Patent”) and European Patent 1,299,505 B1 (the “505 Patent”). (Doc. No. 58, Ex. 12; Sadeghbeigi Decl. ¶ 11.) The 328 Patent and the 505 Patent relate to the standpipe and withdrawal well technologies of the FCC Unit, not to the spent catalyst distributor. (Doc. No. 58, Exs. 13, 14; Sadeghbeigi Decl. ¶ 11.) Ye Mon Chen and Brosten are listed as inventors of the 328 Patent, while Chen is listed as inventor of the 505 Patent. (Doc. No. 58, Exs. 13, 14.)

On September 1, 2004, Ye Mon Chen called and spoke with Sadeghbeigi about his concerns that the proposed designs for the revamped standpipe and withdrawal well might infringe on one or more of Shell’s patents. (Sadeghbeigi Decl. ¶ 12.) Sadeghbeigi assured Chen that RMS would respect Shell’s intellectual property and did not intend to use any of Shell’s

proprietary technology. He also informed Chen that RMS planned to use open art designs. (Sadeghbeigi Decl. ¶ 12; Doc. No. 58, Ex. 17.)

Both Sadeghbeigi and Baebler believed that RMS and Shell had resolved Shell's concerns with the standpipe and withdrawal well technology to be used in the 2007 revamp. (Baebler Decl. ¶ 12; Sadeghbeigi Decl. ¶ 13.) RMS sent another RFQ to Chen at Shell. (Doc. No. 58, Ex. 18.) Shell subsequently developed a proposal to provide Tesoro with its "catalyst circulation enhancement technology" ("CCET"). (Doc. No. 58, Ex. 21.) During the development of Shell's proposal, Frank Khouw, an inventor of the 318 Patent, reviewed and commented on the "deal." (Doc. No. 58, Ex. 20.) Chen emailed Shell's final proposal to Sadeghbeigi and copied Khouw on the email. (Doc. No. 58, Ex. 21.) Shell's final proposal including a drawing of the then-current design of the SLC Refinery's FCC Unit, including the 1980 Design of the spent catalyst distributor. (Doc. No. 58, Ex. 22.) Tesoro ultimately decided to use an open art design instead of Shell's proposed modification to the standpipe and withdrawal well. (Sadeghbeigi Decl. ¶ 15.) Throughout its communication with RMS and Tesoro about the 2007 revamp of the FCC Unit, Shell was silent with respect to Tesoro's use of the 1980 Design in the FCC Unit. (Baebler Decl. ¶¶ 12, 13; Sadeghbeigi Decl. ¶ 12; Chen Decl. ¶ 8.)

In 2005, RMS modified the 1980 Design of the spent catalyst distributor to have five arms (instead of three arms) that slope downward at an angle of 20 (rather than 30) of horizontal (the "Modified Design"). (Baebler Decl. ¶ 13; Sadeghbeigi Decl. ¶ 16.) Sadeghbeigi spoke with and, on October 27, 2005, sent Brosten a drawing of the Modified Design to ask whether there were "any major flaws in this design." (Doc. No. 58, Ex. 23; Sadeghbeigi Decl. ¶ 17.) Brosten responded with some technical comments on the design, including a suggestion about the angle of the arms. (Doc. No. 58, Ex. 24; Sadeghbeigi Decl. ¶ 17.) However, neither Brosten nor anyone

else at Shell raised concerns that either the 1980 Design or the Modified Design might infringe any Shell patent. (Sadeghbeigi Decl. ¶ 17; Baebler Decl. ¶ 13.)

In April 2007, Tesoro shut down the SLC Refinery's FCC Unit to conduct extensive modifications, including the replacement of the 1980 Design spent catalyst distributor with the Modified Design spent catalyst distributor. (Baebler Decl. ¶ 14.) Tesoro spent approximately \$22,252,000 on the revamp, approximately \$167,000 of which related to the cost of manufacturing and installing the Modified Design spent catalyst distributor. (*Id.*; Sadeghbeigi Decl. ¶ 18.)

During the same month, Sadeghbeigi communicated with Brosten about various spent catalyst distributor designs. In April 2007, Sadeghbeigi emailed Brosten a copy of a spent catalyst distributor design similar to the one used in the SLC Refinery's FCC Unit. (Doc. No. 58, Exs. 25, 26; Sadeghbeigi Decl. ¶ 22; Brosten Decl. ¶ 4.) Brosten responded that the "added arms" of the updated design would make a big difference. (Doc. No. 58, Exh. 26A.) Brosten did not voice any objections to the use of the design as potentially infringing on any Shell patent. (Sadeghbeigi Decl. ¶ 22; Brosten Decl. ¶ 7.) Brosten and Sadeghbeigi also communicated about the Modified Design's "afterburn issues," and again about another spent catalyst distributor design. (Sadeghbeigi Decl. ¶ 23; Brosten Decl. ¶ 6; Doc. No. 58, Ex. 28.)

In March 2008, Sadeghbeigi and several Shell employees, including Chen, attended the National Petro Chemical and Refiners Association ("NPRA") annual meeting. (Sadeghbeigi Decl. ¶ 24; Chen Decl. ¶ 9.) After a presentation by Martin Nieskins, who was employed as Shell's "Global Manager Catalytic Cracking," Sadeghbeigi voiced concerns about Shell's catalytic cracking technology (Sadeghbeigi Decl. ¶ 24.) Specifically, Sadeghbeigi criticized Shell's failure to maintain state of the art technology and to design reliable products.

(Sadeghbeigi Decl. ¶ 24.) The next day, Sadeghbeigi apologized for his remarks before presenting his own paper discussing the 2007 revamp of the SLC Refinery's FCC Unit. (Doc. No. 58, Exs. 29, 30.) During the presentation, Sadeghbeigi disclosed the Modified Design spent catalyst distributor that had been installed. (*Id.*; Chen Decl. ¶ 9.)

Soon after the NPRA meeting, Nieskins wrote to two Shell employees to advise them of Sadeghbeigi's remarks. Nieskin described Sadeghbeigi's behavior as "unprofessional," and indicated that other attendees had been taken aback by the remarks. (Doc. No. 58, Ex. 30.) Ye Mon Chen also wrote to several Shell employees about Sadeghbeigi's "damaging comments on Shell refineries' reliabilities and Shell GS FCC technology." (Doc. No. 58, Ex. 31.) Chen urged individuals who attended Nieskins' presentation to send a note to the NPRA official urging NPRA officials to take action against Sadeghbeigi (*Id.*) At least one Shell employee did so. (Doc. No. 58, Exs. 32, 33.) NPRA eventually banned Sadeghbeigi from future events. (Sadeghbeigi Decl. ¶ 25; Doc. No. 58, Ex. 33.)

The matter did not end there. In response to Chen's correspondence about the NPRA incident, Shell's General Manager of Licensing asked, "Should we take legal action[?]" (Doc. No. 58, Ex. 34.) Chen responded, "[A] FCC colleague gave me a head-up of the technology implemented by Reza for Tesoro Salt Lake. Reza presented his paper before mine, and indeed there are two components that are potential infringement of Shell GS FCC patents." (Doc. No. 58, Ex. 35.) Chen subsequently brought the matter to the attention of Shell's legal department. (Chen Decl. ¶ 11.)

In November 2009, Sadeghbeigi first learned of the Modified Design's potential infringement on the 318 Patent when he was advised of the filing of this lawsuit. (Sadeghbeigi Decl. ¶ 26.) Shell does not have any licensees of the 318 Patent. (Doc. No. 58, Ex. 38 at 6.)

II. MOTION FOR SUMMARY JUDGMENT ON EQUITABLE ESTOPPEL AND LACHES

Defendants have moved for summary judgment on their defenses of equitable estoppel and laches. Laches and estoppel are equitable defenses, committed to the discretion of the trial court. *A. C. Aukerman Co. v. R. L. Chaides Constr. Co.*, 960 F.2d 1020, 1028 (Fed. Cir. 1992). Both defenses ultimately turn on underlying factual determinations. *Id.* at 1332-33. Summary judgment thus is appropriate only when there is no genuine issue of material fact and when the movant is entitled to judgment as a matter of law. *Hemstreet v. Computer Entry Systems Corp.*, 972 F.2d 1290, 1292 (Fed. Cir. 1992).

A motion for summary judgment under Federal Rule of Civil Procedure 56 requires the Court to determine whether the moving party is entitled to judgment as a matter of law based on the evidence thus far presented. FED. R. CIV. P. 56(c). Summary judgment is proper “if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of law.” *Kee v. City of Rowlett*, 247 F.3d 206, 210 (5th Cir. 2001) (quotations omitted). A genuine issue of material fact exists if a reasonable jury could enter a verdict for the non-moving party. *Crawford v. Formosa Plastics Corp.*, 234 F.3d 899, 902 (5th Cir. 2000). The Court views all evidence in the light most favorable to the non-moving party and draws all reasonable inferences in that party’s favor. *Id.* Hearsay, conclusory allegations, unsubstantiated assertions, and unsupported speculation are not competent summary judgment evidence. F.R.C.P. 56(e)(1); *See, e.g., Eason v. Thaler*, 73 F.3d 1322, 1325 (5th Cir. 1996), *McIntosh v. Partridge*, 540 F.3d 315, 322 (5th Cir. 2008); *see also Little v. Liquid Air Corp.*, 37 F.3d 1069, 1975 (5th Cir. 1994) (noting that a non-movant’s burden is “not satisfied

with ‘some metaphysical doubt as to the material facts.’” (citing *Matsushita Elec. Indus. Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574, 586 (1986)).

A. Laches

Laches is an equitable defense to patent infringement that bars a patentee’s claim for damages prior to suit. 35 U.S.C. § 282. To bring a successful laches defense, a defendant must prove two factors: (1) the plaintiff delayed filing suit for an unreasonable and inexcusable length of time from the time the plaintiff knew or reasonably should have known of its claim against the defendant; and (2) the delay operated to the prejudice or injury of the defendant. *Intirtool, Ltd. v. Texar Corp.*, 369 F.3d 1289, 1297 (Fed. Cir. 2004). In determining whether a laches defense applies, a court must look at all the particular facts and circumstances of each case and weigh the equities of the parties. *Bott v. Four Star Corp.*, 807 F.2d 1567, 1576 (Fed. Cir. 1986).

The period of delay is measured beginning at the time the patentee has actual or constructive knowledge of the allegedly infringing activity. *Adelberg Laboratories, Inc. v. Miles, Inc.*, 921 F.2d 1267, 1270 (Fed. Cir. 1990); *see also Ultimax Cement Mfg. Corp. v. CTS Cement Mfg. Corp.*, 587 F.3d 1339, 1350 (Fed. Cir. 2009). The length of time which may be deemed unreasonable has no fixed boundaries but rather depends on the circumstances. *Aukerman*, 960 F.2d at 1032. In order to determine whether the delay is excusable, a court must consider and weigh any justification offered by the plaintiff for its delay. *Id.* at 1033. Recognized excuses have included other litigation, negotiations with the accused, poverty and illness, wartime conditions, the extent of infringement, and dispute over patent ownership. *Id.*

A defendant must show that it suffered material prejudice, either economic or evidentiary, as a result of the plaintiff’s delay. *Aukerman*, 960 F.2d at 1033. “Economic prejudice may arise where a defendant and possibly others will suffer the loss of monetary

investments or incur damages which likely would have been prevented by earlier suit.” *Id.*

“Making heavy capital investment and increasing production can constitute prejudice.” *Adelberg Laboratories, Inc.*, 921 F.2d at 1272; *see also Technology for Energy Corp. v. Computational Systems, Inc.*, No. 92-1542, 92-1551, 1993 U.S. App. LEXIS 24556, *21 (finding economic prejudice where defendant expanded its business, including employees, sales, and research and development); *but see Ecolab, Inc. v. Envirochem, Inc.*, 264 F.3d 1358 (Fed. Cir. 2001).

1. 2004 RFQ

Defendants argue that Shell knew or should have known of Defendants’ allegedly infringing activities in 2004 when Defendants disclosed the 1980 Design spent catalyst distributor as part of the RFQ sent by RMS to Shell. Shell does not dispute that it received the 2004 RFQ from RMS, that it communicated with RMS and Tesoro about the RFQ, and that it submitted a bid in response to the RFQ.

As an initial matter, we focus on Shell’s actual or constructive knowledge of the Modified Design rather than Shell’s actual or constructive knowledge of the 1980 Design. We so focus because Shell has sued for infringement based upon Defendants’ acts in relation to the Modified Design, not the 1980 Design. Shell’s knowledge of the 1980 Design is relevant only insofar as it may have put Shell on actual or constructive notice of the Modified Design.

Further, we construe the “allegedly infringing activities” to include not only the installation of the Modified Design spent catalyst distributor in April 2007 and its continued use, but also RMS’s provision of engineering designs, drawings and specifications to Tesoro for the modifications to be made to the spent catalyst distributor. Our interpretation is in line with Shell’s complaint, which alleges that both Tesoro’s installation and use of the Modified Design spent catalyst distributor *and* RMS’s provision of designs and drawings constitute direct

infringement. Shell's complaint also alleges that RMS's provision of designs and drawings, and its assistance in fabricating the spent catalyst distributor, constitutes inducement of infringement. Shell changes course in its response brief and argues that "allegedly infringing activities" cannot have occurred prior to April 2007, when the Modified Design spent catalyst distributor was installed, because any activities that occurred prior to April 2007 do not constitute an act of infringement under 35 U.S.C. § 271. This assertion is belied not only by Shell's complaint, which details many allegedly infringing activities that occurred prior to installation, but also the text of 35 U.S.C. § 271 that imposes liability for many acts other than simply using an infringing item.

With this in mind, we turn to the issue of whether the 2004 RFQ provided Shell with actual or constructive knowledge of Defendants' allegedly infringing activities or the Modified Design. It is clear that the 2004 RFQ sent by RMS to Shell did not provide Shell with actual knowledge of the Modified Design. The 2004 RFQ contained only a drawing depicting the 1980 Design and did not contain any drawing or description of the Modified Design. Neither did the 2004 RFQ provide Shell with actual knowledge of Defendants' allegedly infringing activities. The RFQ did not list the spent catalyst distributor as an item for which Tesoro sought bids. The RFQ omitted discussion of Tesoro's planned modification of the spent catalyst distributor or installation of a new one. Finally, all of the communication between Shell and Defendants about the RFQ, including communication about potential patent infringement, focused on the standpipe and well hopper. These communications did not provide Shell with actual notice that Defendants' planned to modify the spent catalyst distributor, let alone use the Modified Design.

We next examine whether the 2004 RFQ provided Shell with constructive knowledge of the Modified Design or Defendants' allegedly infringing activities. "The law is well settled that

where the question of laches is in issue the plaintiff is chargeable with such knowledge as he might have obtained upon inquiry, provided the facts already known by him were such as to put upon a man of ordinary intelligence the duty of inquiry.” *Wanlass v. General Electric Co.*, 148 F.3d 1334, 1338 (Fed. Cir. 1998) (quoting *Johnston v. Standard Mining Co.*, 148 U.S. 360 (1893)). A defendant’s “pervasive, open, and notorious activities” may impart to the patentee a duty to inquire. *Hall v. Aqua Queen Mfg., Inc.*, 93 F.3d 1548, 1553 (Fed. Cir. 1996). Such activities may include not only sales, marketing, public use, or published descriptions of potentially infringing activity that are directly known to the patentee, but also activities that are sufficient prevalent in the inventor’s field of endeavor. *Wanlass*, 148 F.3d at 1338.

We do not find that the 2004 RFQ provided sufficient facts to put upon Shell a duty of inquire as to Defendants’ infringing activities or the Modified Design. The 2004 RFQ set forth a specific list of items for which Defendants sought bids from licensors. This list did not include the spent catalyst distributor. The 2004 RFQ did not describe the 2007 revamp as project in which Tesoro would modify all parts of the regenerator. In addition, the communications between Shell and Defendants about the RFQ did not reference Defendants’ planned modification to the spent catalyst distributor, their intended use of the Modified Design, or any other potentially infringing activity. Based on the summary judgment record as it currently stands, we cannot conclude that Defendants were pervasive, open, or notorious about their plans, infringing or not, with respect to the spent catalyst distributor. As such, Shell did not have a duty to inquire as to Defendants’ activities in order to determine whether they were infringing.

We conclude that the period of delay cannot begin in 2004 because Shell did not have actual or constructive knowledge at that time of Defendants’ allegedly infringing activities.

2. October 2005 Disclosures

Defendants also argue that Shell knew or should have known of Defendants' allegedly infringing activities in October 2005, when Sadeghbeigi emailed Brosten a copy of the Modified Design spent catalyst distributor. Shell does not dispute the October 2005 communications between Sadeghbeigi and Brosten. However, Shell has submitted an affidavit from Brosten stating that he did not know of the 318 Patent at the time of the October 2005 communications. In addition, Brosten's affidavit states that Sadeghbeigi asked Brosten not to share the Modified Design with other Shell employees. Brosten did not do so. Defendants have not controverted Brosten's statements. Therefore, we accept the statements in Brosten's affidavit regarding the October 2005 communications as undisputed facts.

Reviewing the undisputed facts proffered by Defendants and Shell, we find that Brosten possessed both actual and constructive knowledge of Defendants' allegedly infringing activities as of October 27, 2005. On that date, Sadeghbeigi emailed Brosten a copy of an engineering drawing depicting the Modified Design spent catalyst distributor. The drawing clearly states that it had been prepared by RMS for Tesoro's SLC Refinery. Provision of this drawing to Brosten provided Brosten with actual knowledge of RMS's delivery to Tesoro of engineering designs, drawings and specifications for the Modified Design spent catalyst distributor. All of these activities have been alleged by Shell in its complaint to constitute direct infringement and inducement of infringement. In addition, the drawing provided Brosten with constructive knowledge of the other allegedly infringing activity performed by Defendants—i.e., RMS's provision of assistance and advice to Tesoro in its contracting, hiring and supervision of vendors for the fabrication and installation of the Modified Design spent catalyst distributor, Tesoro's installation of the Modified Design in the SLC Refinery—that Shell alleges in its complaint are acts of infringement. An engineering drawing such as the one provided to Brosten would suggest

that a company planned to use such a design. At that point, a person would have a duty to inquire as to the extent of the potential infringer's commercialization of the design. In doing so, the person would learn of the manufacture of the item and its planned use, all of which are allegedly infringing activities. Thus, we find that Brosten was provided with sufficient information via the engineering drawing of the Modified Design that he should have inquired as to the exact nature of Defendants' activities.

Shell argues that Brosten never disclosed his knowledge of the Modified Design to other Shell employees. Shell contends that its first knowledge that Defendants had installed the infringing Modified Design spent catalyst distributor came in 2008, when Sadeghbeigi presented at the NPRA conference. It appears that Shell is arguing that Brosten's individual knowledge cannot be imputed to Shell as a corporation, though Shell does not explicitly say so.

The Federal Circuit has used general agency law in determining whether to impute the knowledge of an employee to the corporation. *See Long Island Savings Bank, FSB v. United States*, 503 F.3d 1234, 1249 (Fed. Cir. 2007); *Manville Sales Corp. v. Paramount Systems, Inc.*, 917 F.2d 544, 553 (Fed. Cir. 1990). The Restatement (Third) of Agency outlines the circumstances in which an agent's notice of a fact is imputed to the principal:

For purposes of determining a principal's legal relationship with a third party, notice of a fact that an agent knows or has reason to know is imputed to the principal if knowledge of the fact is material to the agent's duties to the principal, unless the agent

- (a) acts adversely to the principal as state in § 5.04, or
- (b) is subject to a duty to another not to disclose the fact to the principal.

Restatement (Third) of Agency § 5.03 (2005). An agent has notice of a fact if the agent "knows the fact, has reason to know the fact, . . . or should known the fact to fulfill a duty owed to another person." *Id.* § 5.01(3). "A principal may not rebut the imputation of an agent's notice of a fact by establishing that the agent kept silent." *Id.* § 5.03 cmt. b. Notice of a fact will not be

imputed to the principal when the “agent acts adversely to the principal in a transaction or matter, intending to act solely for the agent’s own purposes or those of another person.” *Id.* § 5.04. In the patent context, at least one district court has held that it is unnecessary for an employee with knowledge of infringing activities to have knowledge of the patent before imputing knowledge of the infringing activity to the corporation. *Tenneco Automotive Operating Co. v. Visteon Corp.*, 375 F. Supp. 2d 375, 382 n.5 (D. Del. 2005). “To hold otherwise would allow patentees to preclude laches defenses merely by not informing employees of patents.” *Id.*

Defendants have established that Brosten was on notice of Defendants’ allegedly infringing activities, both in terms of actual knowledge and constructive knowledge. However, Defendants have not established by preponderance of the evidence that knowledge of Defendants’ use of the Modified Design was material to Brosten’s duties to Shell such that Brosten’s knowledge should be imputed to Shell. We do not think it dispositive that Brosten did not know of the 318 Patent in October 2005. Rather, the question of imputation turns on whether Brosten’s duties to Shell would have made knowledge of the Modified Design significant. Some courts have found that knowledge possessed by certain individuals, by virtue of their position within the organization, is imputed to the organization. *See Manville Sales Corp.*, 917 F.2d at 553 (holding that knowledge or belief held by corporation’s officers as imputable to corporation); *Olympia Werke Aktiengesellschaft v. General Electric Co.*, 545 F. Supp. 598, 613 (W.D. Va. 1982), *aff’d by*, 712 F.2d 74 (4th Cir. 1983) (notice to plaintiff’s high level management officials constitutes notice to plaintiff).

Here, it is unclear whether Brosten occupied such a position. Brosten appears to have specialized in the area of FCC Units, both at Shell and at Tesoro. In addition, he was aware of some of Shell’s patents, as evidenced by his notifying Chen that the standpipe and well hopper in

RMS's initial 2004 RFQ may infringe upon Shell's patents. Brosten may have possessed a duty to familiarize himself with Shell's patents, keep abreast of new developments in spent catalyst distributors, and evaluate new FCC Unit technology and designs with an eye to their potential infringement upon Shell's patents. At this stage, however, the summary judgment evidence does not establish that Brosten possessed such a duty. Moreover, there is some evidence that Brosten may have acted adversely to Shell when he provided advice to Sadeghbeigi. In addition, Sadeghbeigi's request that Brosten not disclose the Modified Design to other Shell employees may have imposed upon Brosten a duty not to disclose the design. However, the scope of Brosten's duty to Shell, once established, may suggest that Brosten should not have accepted such a condition on his candor. We cannot conclude, at this stage of the proceedings, that Brosten's actual and constructive knowledge should be imputed to Shell. As a result, we cannot conclude that Shell knew or had reason to know of Defendants' allegedly infringing activities in October 2005.²

Since Defendants have not met their burden in establishing that the laches period began in October 2005, we do not need to address whether Shell's failure to file suit until 2009 was unreasonable or inexcusable.³ Without knowing the appropriate period of delay, we cannot analyze whether the delay resulted in material prejudice to Defendants. At this stage of the proceedings, we deny summary judgment to Defendants on the defense of laches.

B. Equitable Estoppel

To succeed on a defense of equitable estoppel, a defendant must establish: (1) the patentee, through misleading conduct, leads the alleged infringer to reasonably infer that the

² For identical reasons, Brosten's actual or constructive knowledge in April 2007 of Defendants' allegedly infringing activities cannot be imputed to Shell based on the current summary judgment record.

³ We need not address whether the period between the 2008 NPRA meeting (when Sadeghbeigi undisputedly disclosed the Modified Design to Shell) to the filing of suit in 2009 constitutes unreasonable and inexcusable delay since Defendants have not argued that it does.

patentee does not intend to enforce its patent against the alleged infringer; (2) the alleged infringer relies on that conduct; and (3) due to its reliance, the allegedly infringer will be materially prejudiced if the patentee is allowed to proceed with its claim. *Aukerman*, 960 F.2d at 1028.

In order to establish that the patentee's conduct was misleading, the alleged infringer must show that the conduct supported an inference that the patentee did not intend to press an infringement claim against the alleged infringer. *Aukerman*, 960 F.2d at 1042. Therefore, the alleged infringer must be aware of the patentee and/or its patent. *Id.* In addition, the alleged infringer must know or reasonably be able to infer that the patentee has known of its activities for some time. *Id.* "Conduct" may include specific statements, action, inaction, or silence where there was an obligation to speak. *Aspex Eyewear, Inc. v. Clariti Eyewear, Inc.*, 605 F.3d 1305, 1310 (Fed. Cir. 2010). "Silence alone will not create an estoppel unless there is a clear duty to speak or somehow the patentee's continued silence reenforces the defendant's inference from the plaintiff's known acquiescence that the defendant will be unmolested." *Aukerman*, 960 F.2d at 1043-1044. "Plaintiff's inaction must be combined with other facts respecting the relationship or contacts between the parties to give rise to the necessary inference that the claim against defendant is abandoned." *Id.* at 1042.

A defendant must show that it "substantially relied" on the misleading conduct of the patentee in connection with taking some action. *Aukerman*, 960 F.2d at 1042-43. There is no reliance when a defendant continues infringing because of a belief of non-infringement rather than a misrepresentation by the patentee. *See, e.g., Vaupel Textilmaschinen KG v. Meccanica Euro Italia SPA*, 944 F.2d 870, 879 (Fed. Cir. 1991).

A defendant may show prejudice through a change in its economic position. *Aspex Eyewear, Inc.*, 605 F.3d at 1313.

1. Misleading Silence

Defendants argue that Shell's silence after being made aware of the 1980 Design in 2004, and of the Modified Design in October 2005 and April 2007, was misleading.

A patentee's silence can be misleading as long as there is a clear duty to speak, or is combined with other facts regarding the relationship between the parties that would lead the accused infringer to believe that the patentee's claim was abandoned. *Aukerman*, 960 F.2d at 1042, 1043-44. "Silence alone is not sufficient affirmative conduct to give rise to estoppel." *Meyers v. Asics Corp.*, 974 F.2d 1304, 1308 (Fed. Cir. 1992) (quoting *Hottel Corp. v. Seaman Corp.*, 833 F.2d 1570, 1573 (Fed. Cir. 1987)).

Shell's silence after receiving the 2004 RFQ containing the 1980 Design spent catalyst distributor was not misleading. First, as Shell has not sued for infringement based on the 1980 Design, we cannot say that Shell possessed a duty to raise a claim for infringement upon receiving the 1980 Design. Neither did Shell possess a duty to interpose its concerns about future modifications to the spent catalyst distributor because the 2004 RFQ did not indicate that Defendants were considering modifications to the distributor.

Second, Shell's communications with Defendants about potential patent infringement focused on the standpipe and well hopper technology. Shell did not raise any patent claims with respect to the 1980 Design spent catalyst distributor. We agree with Defendants that the communication does not have to be an "immediate threat of enforcement." See *Aspex Eyewear, Inc.*, 605 F.3d at 1311; *ABB Robotics, Inc.*, 52 F.3d at 1064. However, in cases where estoppel has been found, the parties have had at least some type of communication about the patent-at-

issue. *See, e.g., Aspex Eyewear, Inc. v. Clariti Eyewear, Inc.*, 605 F.3d 1305 (Fed. Cir. 2010); *ABB Robotics, Inc. v. GMFanuc Robotics Corp.*, 52 F.3d 1062 (Fed. Cir. 1995); *Adelberg Laboratories, Inc.*, 921 F.2d at 1268-69. Since Shell did not raise any claims related to the 318 Patent, its silence could not have induced Defendants to believe that Shell abandoned its claim with respect to the 318 Patent. *Adelberg Laboratories, Inc.*, 921 F.2d at 1274. We find that the relationship between the parties in 2004 does not give rise to the necessary inference that Shell had abandoned its 319 Patent claim against Defendants.

The 2004 RFQ is relevant in providing context to the October 2005 and April 2007 communications between Sadeghbeigi and Brosten. By this point, it may have been reasonable for Defendants to expect Shell to raise any patent-related concerns regarding modifications to the FCC Unit, based upon Shell's previous reaction to the 2004 RFQ. Shell's failure to do so may have lulled Defendants into a sense of security that Shell did not intend to enforce any patent claims with respect to the Modified Design spent catalyst distributor. Although Defendants have a colorable argument that Shell's silence after October 2005 was misleading, we cannot conclude that, at this stage of the proceedings, they are entitled to summary judgment as a matter of law. First, Shell contends that Brosten did not share the Modified Design with his Shell colleagues. Brosten himself did not know about the 318 Patent. As described in the previous section, we cannot conclude that Brosten's knowledge of the Modified Design should be imputed to Shell. Unless it possessed knowledge of the Modified Design, Shell did not have a duty to raise its patent claims. Second, Sadeghbeigi told Brosten not to share the Modified Design with other colleagues at Shell. We do not know why Sadeghbeigi made this request. When Brosten subsequently remained silent about the Modified Design's potential infringement upon the 318 Patent, one inference is that Shell did not intend to pursue any patent claims based on the

Modified Design. Another inference is that Shell did not raise patent concerns because Sadeghbeigi ensured that Shell's senior management did not find out about the Modified Design. In the latter case, Defendants could not have been misled by Shell's silence because they knew Shell was not fully aware of the Modified Design. In order to obtain summary judgment, the inference that Shell's silence meant that Defendants could continue their use of the Modified Design unmolested must be the "only possible inference from the evidence." *Aukerman*, 960 F.2d at 1044. We cannot conclude that this is the only possible inference. We find that Defendants have not met their burden of proof in establishing that Shell's silence after disclosures in October 2005 and April 2007 was misleading. Since "misleading conduct" is an essential element of the defense of equitable estoppel, we must deny summary judgment to Defendants. We need not decide whether Defendants have established reliance or material prejudice.

II. MOTION TO EXCLUDE EXPERT TESTIMONY OF YE-MON CHEN

Prior to the *Markman* hearing held on December 1, 2010, Defendants moved to exclude the expert testimony of Ye-Mon Chen if proffered by Shell during the hearing. Shell did not proffer the expert testimony of Ye-Mon Chen during the *Markman* hearing. The Court has not relied on Mr. Chen's expert opinion in construing the asserted claims of the 318 Patent. Therefore the Court denies the motion to exclude Ye-Mon Chen's testimony as moot.

III. LEGAL STANDARD- MARKMAN HEARINGS GENERALLY

A. Claim Construction

Claim construction is a matter of law, and thus the task of determining the proper construction of all disputed claim terms lies with the Court. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996). The Federal Circuit has opined extensively on the proper

approach to claim construction, most notably in its recent opinion in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

The goal of a *Markman* hearing is to arrive at the ordinary and customary meaning of a claim term in the eyes of a person of ordinary skill in the art. *Phillips*, 415 F.3d at 1313. In order to do so, the Court should first look to intrinsic evidence to decide if it clearly and unambiguously defines the disputed terms of the claim. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1585 (Fed. Cir. 1996). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *Phillips*, 415 F.3d at 1314.

1. Claim Language

Words of a claim are generally given their ordinary and customary meaning, which is the meaning a term would have to a person of ordinary skill in the art after reviewing the intrinsic record at the time of the invention. *O2 Micro Int'l Ltd. v. Beyond Innovation Technology Co.*, 521 F.3d 1352, 1360 (Fed. Cir. 2008). Thus, the inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation. *Phillips*, 415 F.3d at 1313. That starting point is based on “the well-settled understanding that inventors are typically persons skilled in the field of the invention, and that patents are addressed to, and intended to be read by, others of skill in the pertinent art.” *Id.* A district court is not obligated to construe terms with ordinary meanings, lest trial courts be inundated with requests to parse the meaning of every word in the asserted claims. *O2 Micro Intern. Ltd.*, 521 F.3d at 1360; *see also Biotec Biologische Naturverpackungen GmbH & Co. KG v. Biocorp, Inc.*, 249 F.3d 1341, 1349 (Fed. Cir. 2001) (finding no error in non-construction of “melting”); *Mentor H/S, Inc. v. Med. Device Alliance, Inc.*, 244 F.3d 1365, 1380 (Fed. Cir. 2001) (finding no error in the lower court's refusal to construe “irrigating” and “frictional heat”).

The claims themselves provide substantial guidance as to the meaning of particular claim terms. *Phillips*, 415 F.3d at 1314. To begin with, the context in which a term is used in the asserted claim can be highly instructive. *Id.* Other claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term. *Vitronics*, 90 F.3d at 1582. Because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. *Phillips*, 415 F.3d at 1314. “[D]ifferent words or phrases used in separate claims are presumed to indicate that the claims have different meanings and scope.” *Seachange Int’l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1368 (Fed. Cir. 2005). Furthermore, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that that limitation in question is not present in the independent claim. *Phillips*, 415 F.3d at 1314 (citing *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004)).

2. Specification

In addition, the specification, or the part of the patent where the inventor describes and illustrates the invention in significant detail, “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Vitronics*, 90 F.3d at 1582. The importance of the specification in claim construction derives from its statutory role. The relationship between the written description and the claims is enforced by the statutory requirement that the specification describe the claimed invention in “full, clear, concise, and exact terms.” 35 U.S.C. § 112, ¶ 1. Consistent with that general principle, cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs. *Phillips*, 415 F.3d at 316. In other cases, the specification may

reveal an intentional disclaimer, or disavowal, of claim scope by the inventor. In that instance as well, the inventor has dictated the correct claim scope, and the inventor's intention, as expressed in the specification, is regarded as dispositive. *Id.* The specification may also resolve ambiguous claim terms that are not sufficiently clear to permit the scope of the claim to be ascertained from the words alone. *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). Clear statements of scope in the specification are determinative of the correct claim construction. *Id.* at 1327.

Notably, while the specification may describe very specific embodiments of the invention, the claims are not to be confined to these embodiments. *Ventana Medical Systems, Inc. v. Biogenex Laboratories, Inc.*, 473 F.3d 1173, 1181 (Fed. Cir. 2006) (quoting *Phillips*, 415 F.3d at 1323); *see also DSW, Inc. v. Show Pavilion, Inc.*, 537 F.3d 1342, 1348 (Fed. Cir. 2008) (“Moreover, when claim language is broader than the preferred embodiment, it is well settled that claims are not to be confined to that embodiment.”); *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004) (stating that “[p]articular embodiments appearing in the written description will not be used to limit claim language that has a broader effect”); *Teleflex*, 299 F.3d at 1327 (noting that claim terms take on their ordinary and customary meaning, regardless of number of embodiments disclosed in the specification, unless intrinsic record reflects “expression of manifest exclusion or restriction, representing a clear disavowal of claim scope”).

However, the Federal Circuit has also held there to be certain instances where limiting language contained within a specification can lead to a restrictive construction. For example, in *Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 433 F.3d 1373, 1375 (Fed. Cir. 2006), the court stated:

However, in whatever form the claims are finally issued, they must be interpreted, in light of the written description, but not beyond it, because otherwise they would be interpreted to cover inventions or aspects of an invention that have not been disclosed. Claims are not necessarily limited to preferred embodiments, but, if there are no other embodiments, and no other disclosure, then they may be so limited. One does not receive entitlement to a period of exclusivity for what one has not disclosed to the public.

See also Anderson Corp. v. Fiber Composites, LLC, 474 F.3d 1361, 1367 (Fed. Cir. 2007) (upholding district court's limiting construction of a claim term based on specification language that indicated that the limitation was not a preferred embodiment, but rather "a critical element in the process"); *Honeywell Int'l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006) (holding that the meaning of a claim was limited to the single embodiment disclosed in the specification, and specifically noting that this sole embodiment was consistently referred to as "this invention" or "the present invention"). In *Honeywell*, the Federal Circuit found that the use of "present invention language" within the specification was significant in deciding whether claim terms could be limited by certain disclosed embodiments because "[t]he public is entitled to take the patentee at his word" *Honeywell*, 452 F.3d at 1316-18. Relatedly, in *Toro Co. v. White Consol. Industries, Inc.*, the Federal Circuit relied on the specification description and construed the term "including" so as to limit a patent claim, noting that "not other broader concept was described as embodying the applicant's invention, or shown in any of the drawings, or presented for examination." 199 F.3d 1295, 1301 (Fed. Cir. 1999).

Whether an invention is fairly claimed more broadly than the preferred embodiment in the specification is a question specific to the content of the specification. *Teleflex*, 299 F.3d at 1327. The distinction between using the specification to interpret the meaning of a claim and importing limitations from the specification into the claim is a difficult tightrope that district courts must walk. *Andersen Corp.*, 474 F.3d at 1373; *see also Innova/Pure Water Inc.*, 381 F.3d at 1117 (noting the longstanding difficulty in reconciling the axioms that a claim must be read in

light of the specification and that a court may not read a limitation into a claim from a specification) (citing cases); *Comark Communications, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998) (noting that there is “a fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification”).

3. Prosecution History

Finally, the prosecution history, which has been designated as part of the “intrinsic evidence,” consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent. Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent. *Phillips*, 415 F.3d at 1317. Yet, because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes. *Id.*

Still, “a patentee may limit the meaning of a claim term by making a clear and unmistakable disavowal of scope during prosecution.” *Purdue Pharma L.P. v. Endo Pharms., Inc.*, 438 F.3d 1123, 1136 (Fed. Cir. 2006); *see also Omega Engineering Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003) (finding that the doctrine of prosecution disclaimer is well established and precludes patentees from recapturing through claim construction specific meanings disclaimed during prosecution). A patentee could do so, for example, by clearly characterizing the invention in a way to try to overcome rejections based on prior art. *See, e.g., Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1349 (Fed. Cir. 2004) (limiting the term “transmitting” to require direct transmission over telephone line because the patentee stated during prosecution that the invention transmits over a standard telephone line, thus disclaiming transmission over a packet-switched network); *Alloc v. Int'l Trade Comm'n*, 342 F.3d 1361, 1372

(Fed. Cir. 2003) (finding the patentee expressly disavowed floor paneling systems without “play” because the applicant cited the feature during prosecution to overcome prior art); *Bell Atl. Network Servs. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1273 (Fed. Cir. 2001) (limiting operation of the “transceiver” to the three stated modes because of clearly limiting statements made by the patentee to try to overcome a prior art rejection).

4. Extrinsic Evidence

Only if there is still some genuine ambiguity in the claims, after consideration of all available intrinsic evidence, should a trial court resort to extrinsic evidence, such as expert witness testimony, dictionary definitions, and legal treatises. While extrinsic evidence “can shed useful light on the relevant art,” it is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’ ” *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004) (quoting *Vanderlande Indus. Nederland BV v. Int'l Trade Comm'n*, 366 F.3d 1311, 1318 (Fed. Cir. 2004)). The judicial arbiter must be sufficiently informed so that she may step into the shoes of the ordinary skilled artisan. It is here that the use of extrinsic evidence makes the most sense.

B. Indefiniteness

A claim is invalid under 35 U.S.C. § 112, ¶ 2 if it fails to “particularly point out and distinctly claim the subject matter that the applicant regards as the invention.” A party seeking to invalidate a claim as indefinite must show by clear and convincing evidence that one skilled in the art would not understand the scope of the claim when read in light of the specification. *Mass Engineering Design, Inc. v. Ergotron, Inc.*, 559 F. Supp. 2d 740, 759 (E.D. Tex. 2008) (citing *Intellectual Property Dev. Inc. v. UA-Columbia Cablevision of Westchester, Inc.*, 336 F.3d 1308, 1319 (Fed. Cir. 2003)). Close questions of indefiniteness in patent litigation are properly

resolved in favor of the patentee, that is, the owner of the patent in question. *Bancorp Services LLC v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1371 (Fed. Cir. 2004).

C. Means-Plus-Function Claims

35 U.S.C. Section 112, ¶ 6 provides:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, *and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof* (emphasis added).

Means-plus-function claims contain only purely functional limitations but do not provide the structures that perform the recited function. *See Phillips*, 415 F.3d at 1311; *Envirco Corp. v. Clestra Cleanroom, Inc.*, 209 F.3d 1360, 1365 (Fed. Cir. 2000). Section 112, ¶ 6 allows a patentee to “describe an element of his invention by the result accomplished or the function served, rather than describing the item or element to be used.” *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27 (1997). The claim is then interpreted with reference to, and as limited by, the related structure disclosed in the patent for performing the function recited in the claim, or the equivalents thereof. *Welker Bearing Co. v. PHD, Inc.*, 550 F.3d 1090, 1099 (Fed. Cir. 2008); *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1308 (Fed. Cir. 1998).

The court must determine, as a matter of law, whether a phrase should be construed as a means-plus-function term. *Welker Bearing*, 550 F.3d at 1096. If the word “means” is used in a claim element, in combination with a function, the court must presume that Section 112, ¶ 6 applies unless the claim recited a sufficient structure to perform the function. *Id.*; *TriMed*, 514 F.3d at 1259; *Micro Chem., Inc. v. Great Plains Chem Co.*, 194 F.3d 1250, 1257 (Fed. Cir. 1999). If the word “means” is not used, the presumption is that a claim falls outside of Section

112, ¶ 6. *Micro Chem.*, 194 F.3d at 1257. This presumption is rebutted by showing that the claim element recites a function without reciting sufficient structure for performing that function. *Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000). “Sufficient structure exists when the claim language specifies the exact structure that performs the functions in question without need to resort to other portions of the specification or extrinsic evidence for an adequate understanding of the structure.” *TriMed, Inc. v. Stryker Corp.*, 514 F.3d 1256, 1259-60 (Fed. Cir. 2008). If means-plus-function analysis applies, a court must first determine what the claimed function is and then determine the corresponding structures disclosed in the specification that perform that function. *Welker Bearing*, 550 F.3d at 1097; *Minks v. Polaris Indus., Inc.*, 546 F.3d 1364, 1377 (Fed. Cir. 2008).

IV. ANALYSIS—*MARKMAN* CLAIM CONSTRUCTION

The Court will now apply these general principles of claim construction to the terms at issue here. The asserted claims 1-4 are:

1. An apparatus for radial distribution of fluid into a fluid mass contained in a vessel comprising (a) a vessel containing a fluid mass; (b) disposed within said vessel and within said fluid mass, a centrally disposed fluid riser inlet conduit extending through a wall or floor of said vessel and oriented substantially vertically along the fluid riser inlet conduit’s longitudinal axis, said riser inlet conduit having a plurality of fluid conveying arms each of said arms having an end remote from said fluid riser inlet conduit, and each of said arms extending radially and substantially horizontally outward from the vertical axis of said fluid riser inlet conduit and extending radially into the fluid mass wherein the arms have an enclosed length and (c) having along said enclosed length one or more outlet openings at or near the end remote from the fluid riser inlet conduit.
2. The apparatus according to claim 1 wherein said fluid conveying arms have a length of at least one quarter of the radius of the fluid mass.
3. The apparatus according to claim 1 further comprising means for dissipating kinetic energy of the fluid as the fluid is discharged at each outlet opening.
4. The apparatus according to claim 3 wherein said kinetic energy dissipating means comprises impact or expansion means.

(col. 7 l. 7 to col. 8 l. 6.)

A. “FLUID”-RELATED TERMS

1. “fluid mass”

This term is used throughout the 318 Patent. Shell seeks to construe the term as “a fluid bed.” Defendants seek to construe the term as “Fluid contained within the vessel.” The parties’ dispute hinges upon reading language contained in the specification into the claim term itself.

Turning first to the claims themselves, claim 1 of the 318 Patent discloses an apparatus for “radial distribution of fluid into a fluid mass contained in a vessel.” (col. 7 ll. 7-8.) Claim 1 also teaches that the fluid riser inlet conduit must be disposed within “said fluid mass,” and that the fluid conveying arms extend radially into “the fluid mass.” (col. 7 ll. 9-18.) The claim language itself does not require that the fluid mass be coextensive with the fluid bed, but neither does it exclude this possibility. All the claim language requires is that the fluid mass be contained within the vessel, that the fluid riser inlet conduit be located within the fluid mass, and that the fluid conveying arms extend into the fluid mass.

Turning then to the invention specification, it states that: “The term ‘fluid mass’ is used herein with reference to the contents of a vessel into which fluid is discharged in accordance with the present invention.” (col. 3 ll. 3-5.) The Court agrees with Defendants that this language in the specification provides the definition of the term “fluid mass.” If we look solely at this definition, it is clear that the term “fluid mass” is not limited to “fluid bed,” but may include any fluid as long as the fluid is contained within the vessel.

We also agree with Defendants’ contention that the next line in the specification, “Suitably a fluid mass is a fluid bed . . .” (col. 3 l. 7.), teaches a preferred or particular embodiment of the term “fluid mass” rather than providing a definition for the term “fluid mass.” Although the Federal Circuit has provided little guidance as to whether the word “suitably” in

the specification is definitional or merely identifies an specific embodiment, in an unpublished case, it referred to the phrase “suitably planar” as a preferred embodiment of an asserted claim term. *Iscar Ltd. v. Sandvik, A.B.*, No. 99-1577, 2000 U.S. App. LEXIS 22189, *6 (Fed. Cir. Aug. 25, 2000).

In addition, the other instances in which “fluid bed” appears in the specification confirm that it was intended to be a specific embodiment of “fluid mass.” First, the “Field of the Invention” section states that the “present invention relates to a process and corresponding apparatus for introducing a stream of fluid into a *fluid mass* to rapidly attain uniform radial fluid distribution.” (col. 1 ll. 6-8.) (emphasis added). This sentence is followed by one that begins, “*More particularly*” and goes on to describe the process as one for introducing fluidized catalytic cracking particles into a “fluidized bed.” (col 1 ll. 9-11.) (emphasis added). The order of these sentences and the phrase “more particularly” indicates that “fluidized bed” is a particular embodiment of the “fluid mass” in the claimed invention. Second, in the “Background of the Invention” section, the specification highlights how the present invention provides a better process of introducing and mixing fluids into a “fluid mass.” (col. 2 l. 18.) In the present invention, the fluid is discharged “at specific points in the fluid mass while avoiding interaction between the bed and such points until the discharge point is reached.” (col. 2 ll. 20-23.) The phrasing of this sentence suggests that the fluid mass is not necessarily identical to the “bed.” Third, in the “Detailed Description of the Drawings,” Figure 5 is described as illustrating the regeneration vessel in which the riser inlet conduit introduces the fluid catalytic cracking catalyst “into the fluid catalyzed bed.” (col. 6 ll. 50-51.) However, the introduction to this section clearly recites that, “The invention will now be illustrated by means of *non-limiting* example with reference to FIGS. 1 to 5.” (col. 5 ll. 41-42.) (emphasis added).

With the understanding that “fluid bed” is a specific embodiment of the claim term “fluid mass,” we must determine whether we can limit the claim term “fluid mass” to “fluid bed.” The Federal Circuit has held repeatedly that claims should not be confined or limited to specific embodiments contained in the specification. *See, e.g., Phillips*, 415 F.3d at 1323 (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”). However, in *Honeywell*, the Federal Circuit held that the claim terms could be limited to the embodiments disclosed in the specification. 452 F.3d at 1316-18. This holding was grounded upon the patentee’s use of the phrase “present invention” to refer to the specific embodiment contained in the specification. Here, in contrast, the phrase “present invention” always refers to “fluid mass” and not “fluid bed.” (col. 1 ll. 6-8, col. 2 ll. 31-36.) Contrary to Shell’s assertion that the term “fluid mass” is used interchangeably with “fluid bed,” a close reading of the specification establishes that the instances where the invention is described as involving a “fluid bed” also contain language indicating that the description is a particular embodiment of the invention. (col. 1 ll. 9-11, col. 4 ll. 20-30, 50-54, col. 7 ll. 1-5.) In the “Background of the Invention” section, the words “fluid bed” and “bed” are used several times to describe the prior art and deficiencies in the prior art. (col. 1 ll. 37-38, 43-45, 55, 65, col. 2 ll. 1-2, 12.) However, none of these instances limits the invention disclosed in the 318 Patent to distributing or discharging fluid within the fluid bed.

Finally, Shell contends that the term “fluid bed” is a well-understood term of art commonly used in the industry. Defendants do not dispute that the term “fluid bed” may be well-understood in the industry, but note that the inventors chose to use the term “fluid mass” rather than “fluid bed.” We agree that, while “fluid bed” may be well-understood in the art and that Defendants’ expert may use the term “fluid bed” interchangeably with “fluid mass,” the

specification's lexicography must govern. We also note that the inventors did not define "fluid bed" in the manner commonly understood in the art. Instead, the inventors offered the well-understood meaning of "fluid bed" as only a preferred embodiment of the term: "Preferably the fluid bed comprises the reactor, stripper or regenerator bed of a fluid catalytic cracking unit into which catalytic cracking particles having entrained product gases or bearing carbonaceous deposits from cracking reactions are introduced for removal of product gases or combustion of deposits." (col. 3 ll. 12-17.)

The Court will therefore construe the term "fluid mass" as "Fluid contained within the vessel."

2. "fluid riser inlet conduit"

Shell seeks to construe this term as "A conduit for the introduction of fluid catalytic cracking catalyst into the fluidized catalyst bed through the fluid conveying arms." Defendants do not believe that this term needs construction. If construction is required, Defendants propose the plain meaning is "conduit through which fluid is conveyed into the vessel to the fluid conveying arms." Defendants contend that Shell's proposed construction improperly limits the claim term to preferred embodiments in the specification.

We turn first to the claims themselves. The term "fluid riser inlet conduit" appears in claim 1 several times. Claim 1 discloses an apparatus for radial distribution of "fluid into a fluid mass," but does not explicitly state that the fluid travels through the fluid riser inlet conduit. Claim 1 does instruct that the fluid riser inlet conduit possesses "fluid conveying arms" that extend outward from the fluid riser inlet conduit into the "fluid mass." (col. 7 ll. 13-18.) Thus, from the claim language, we understand that the fluid riser inlet conduit is connected to the fluid conveying arms, which extend into the fluid mass.

Turning next to the specification, it states that the “present invention relates to a process and corresponding apparatus for introducing a stream of fluid into a fluid mass to rapidly attain uniform radial distribution.” (col. 1 ll. 6-8.) Later, the present invention is described as providing a “process for radial distribution of fluid within a fluid mass wherein fluid is radially conveyed within and isolated from the fluid mass and discharged via a plurality of distribution points located radially in the fluid mass.” (col. 2 ll. 32-36.)

From the specification, it is clear that what is intended to be conveyed through the fluid riser inlet conduit is “fluid.” The specification defines “fluid” broadly as “liquid, gas or [] a mixture of fluidizing gas and finely divided solids maintained in a fluidized form by the fluidizing gas.” (col. 2 ll. 64-66.) A preferred embodiment of “fluid” is “fluidized solids such as fluidized cracking catalyst particles.” (col. 3 ll. 1-3.) The parties agree that the term “fluid” should be construed broadly. In light of the principle that a claim term should not be limited to a preferred embodiment contained in the specification, we decline to adopt Shell’s proposed construction of the term “fluid riser inlet conduit” that would limit the “fluid” conveyed through the conduit to “fluid catalytic cracking catalyst.” In addition, in light of our construction of the term “fluid mass,” we decline to adopt a construction of “fluid riser inlet conduit” that limits the introduction of fluid to the “fluidized catalyst bed.”

Although we decline to adopt Shell’s proposed construction of this term, we do believe a construction is necessary because of its technical nature. *See United States Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) (claim construction may be necessary to resolve disputes over the meaning or scope of technical terms and words of art). The plain meaning of the term that has been proposed by Defendants is appropriate in relevant respects, as it avoids importing the limitations of the preferred embodiments into the claim term. However,

we alter the proposed construction slightly to incorporate our prior construction of the term “fluid mass.” Therefore, we construe the term “fluid riser inlet conduit” as “conduit for the introduction of fluid into the fluid mass through the fluid conveying arms.”

3. “fluid conveying arms”

Shell seeks to construe this term as “conduits that extend radially into the fluid mass to convey fluid from the fluid riser inlet conduit to distribution points in the fluid mass.” Defendants do not think this term needs construction. Alternatively, if construction is necessary, Defendants propose the plain meaning of this term is “conduits that convey fluid from the fluid riser inlet conduit into the fluid mass.” As an initial matter, both parties agree that the “fluid conveying arms” are conduits that convey fluid from the fluid riser inlet conduit into the fluid mass. The parties disagree over two aspects of Shell’s proposed construction. First, Defendants argue that a construction of the term as conduits that “extend radially into the fluid mass” is redundant with other language in claim 1. Second, Defendants argue that Shell’s proposed construction unnecessarily includes the phrase “to distribution points,” which is already apparent from the claims’ instruction that fluid is distributed by positioning “outlet openings” along the “enclosed length” of the arms.

We agree with Defendants that construing “fluid conveying arms” as “conduits that extend radially into the fluid mass” would render the claim’s description of the physical characteristics of the arms superfluous. Claim 1 provides two physical characteristics for the fluid conveying arms: first, they extend “radially and substantially horizontally outward from the vertical axis of said fluid riser inlet conduit” and, second, they extend “radially into the fluid mass.” (col. 7 ll. 16-18.) Adopting Shell’s proposed construction would render superfluous the claim’s description “radially into the fluid mass.” *See Haemonetics Corp. v. Baxter Healthcare*

Corp., 607 F.3d 776, 781 (Fed. Cir. 2010) (the notice function of patents would be undermined if courts construed claims “so as to render physical structures and characteristics specifically described in those claims superfluous”). To the extent that the claim is limited to a particular physical arrangement, that will be made clear by the entirety of the claim language, not by the Court reading the limitation “extend radially into the fluid mass” into the term “fluid conveying arms.” In addition, Shell’s construction avoids the claim’s instruction that the arms also extend “radially and substantially horizontally” from the fluid riser inlet conduit. We decline to adopt a construction that does not give effect to all of the claim terms. *See id.* (“[W]e construe claims with an eye toward giving effect to all of their terms, even if it renders the claims inoperable or invalid.”) (omitting internal citation).

Reading the claim in light of the specification, we find that the specification does require that the fluid conveying arms convey fluid from the fluid riser inlet conduit to “distribution points.” In the “Background of the Invention” section, the inventors note that the prior art suffered from the inability to keep the fluid within the distributor troughs or channels separate from a fluid bed. The present invention was distinguished over prior art as “discharging the fluid at specific points in the fluid mass while avoiding interaction between the bed and such points until the discharge point has been reached.” (col. 2 ll. 21-23.) The invention is subsequently summarized as a process by which fluid is discharged via a plurality of “distribution points.” (col. 2 l. 35.) The arms, then, are the conduit by which fluid reaches the distribution points.

Therefore, we construe “fluid conveying arms” as “conduits that convey fluid from the fluid riser inlet conduit to distribution points in the fluid mass.”

B. TERMS OF DEGREE

- 1. Horizontal**
- 2. Vertical**

The parties agree that these terms should bear their plain and ordinary meaning. Defendants request an explicit construction of “horizontal” as “level” and “vertical” as “perpendicular to level” in order to assist the jury. In addition, Defendants believe that an explicit construction of these terms would provide a starting point for addressing Plaintiff’s proposed construction of “substantially horizontally.” Shell does not believe that explicit construction is necessary because the terms would be readily understood by a lay juror. In addition, there are no particular or specialized meanings associated with these terms that are apparent to persons of ordinary skill in the art.

We agree with Shell that the terms “horizontal” and “vertical” would be understood by a person of ordinary skill in the art as “level” and “perpendicular to level,” respectively. Moreover, the ordinary meaning of these terms is readily apparent to the layperson. *Phillips*, 415 F.3d at 1314. In such cases, claim construction “involves little more than the application of the widely accepted meaning of commonly understood words.” *Id.* The dictionary definition of “horizontal” is “parallel to the horizon : being on a level.” Webster’s Third New International Dictionary 1090 (1971). The dictionary definition of “vertical” is “perpendicular to the plane of the horizon or to a primary axis: upright, plumb.” *Id.* at 2546.

Therefore, we construe the term “horizontal” as “parallel to the horizon.” We construe the term “vertical” as “perpendicular to the plane of the horizon.”

3. “substantially horizontally”

4. “substantially vertically”

Shell seeks to construe the term “substantially horizontally” as “horizontal to less than 45° from horizontal.” Shell cites the specification and the prosecution history as support for this construction. Shell does not propose a construction for the term “substantially vertically.”

Defendants have moved for summary judgment on the grounds that these two terms, as well as the terms “substantially” and “a plurality of fluid conveying arms . . . extending radially and substantially horizontally outward from the vertical axis of said fluid riser inlet conduit,” are indefinite. Defendants argue that the intrinsic record does not provide sufficiently clear, if any, guidelines for determining the metes and bounds of the term “substantially,” which appears in all of the other challenged terms.

Essentially we are called upon to construe the term “substantially,” and if we cannot, to hold that the use of this term renders claims 1-4 of the 318 Patent indefinite. “Indefiniteness requires a determination whether those skilled in the art would understand what is claimed. To make that determination, we have explained that ‘[i]n the face of an allegation of indefiniteness, general principles of claim construction apply.’” *Enzo Biochem, Inc. v. Applera Corp.*, 599 F.3d 1325, 1332 (Fed. Cir. 2010) (quoting *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1348 (Fed. Cir. 2005)). The Federal Circuit has, on several occasions, construed the term “substantially” in various contexts. *See Deering Precision Instruments, L.L.C. v. Vector Distrib. Sys.*, 347 F.3d 1314, 1323 (Fed. Cir. 2003) (citing cases). It has instructed that, in conducting the analysis, a court should begin by determining the ordinary meaning of the claim terms to one of ordinary skill in the art. *Id.* The dictionary definitions provide a dual ordinary meaning of the term “substantially,” one that connotes a term of magnitude (“significantly” or “considerably”) and one that connotes a term of approximation (“largely” or “essentially”). *Id.* In order to determine which meaning should be adopted, we turn to the intrinsic evidence.

Claim 1 states that the fluid riser inlet conduit is “oriented substantially vertically along the fluid riser inlet conduit’s longitudinal axis.” (col. 7 ll. 11-13.) A few lines later, it describes the fluid conveying arms as extending outward from “the vertical axis of said fluid riser inlet

conduit.” (col. 7 l. 17.) The shift from “longitudinal axis” in the first phrase to “vertical axis” in the second phrase indicates that the two phrases are linked, though they are not identical. When the claim instructs that the fluid riser inlet conduit should be oriented “substantially vertically” along its longitudinal axis, it is also referencing the idea that the conduit should be oriented “substantially vertically” along its vertical axis. Thus, the term “substantially,” when used in conjunction with “vertically,” is a term of approximation. There is no indication that the term “substantially” is being used differently when it appears in the phrase “substantially horizontally.” “A word or phrase *used consistently* throughout a claim should be *interpreted consistently*.” *Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998) (emphasis added). Thus, we also interpret the phrase “substantially horizontally” as a term of approximation.

The specification and prosecution history support this interpretation. The specification states:

The apparatus of the invention comprise a plurality of fluid conveying arms extending radially into the fluid mass. It will be understood that arms may extend substantially in a radius in a cross-sectional plane of the fluid mass, or may be at an angle to the cross-sectional plane, suitably at an angle of up to 60 degrees.

(col. 5 ll. 3-8.) The inventors originally submitted 16 claims to the U.S. Patent and Trademark Office (“PTO”) as part of the application that would become the 318 Patent. The PTO examiner initially rejected claims 8-16. The examiner specifically rejected claim 8, which would later become claim 1 of the 318 Patent, as being “clearly anticipated by Gilliam.” (Doc. No. 90 at 87.) The prior art referenced as Gilliam disclosed arms that were angled upwards at what appeared to be 45°. In response to the PTO examiner’s rejection, the inventors clarified:

The distribution arms taught in Gilliam are positioned below a catalyst bed. In contrast, in the instant claims the arms extend into the fluid bed. This

distinguishes the instant claims over Gilliam. Claim 8 is further amended to provide additional distinctions from Gilliam.

Claim 8 is amended to require the fluid conveying arms to be substantially horizontal. In Gilliam the arms extend at about a 45 degree upward angle. This is natural for the use taught in Gilliam since the hydrocarbon feed through the arms is destined for the catalyst bed above the distribution arms.

(Doc. No. 90 at 78.) The inventors modified claim 8 to include the term “substantially horizontal” as well as the terms “substantially vertical” and “vertical.” It is clear from the prosecution history that the inventors had to disclaim arms that possessed “an angle of up to 60 degrees,” as described in the specification, in order to avoid the prior art. In addition, the inventors disclaimed arms that were angled upwards at about a 45 degree. The inventors did not state their intent to claim arms that possess an angle of up to 45 degrees, nor did they express their intent to impart a meaning to “substantially horizontal” that would cover angles of up to 45 degrees. “Without an express intent to impart a novel meaning to claim terms, an inventor’s claim terms take on their ordinary meaning.” *York Prods. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1572 (Fed. Cir. 1996). The ordinary meaning of “substantially” as a term of approximation is “largely but not wholly that which is specified.” *Webster’s Ninth New Collegiate Dictionary* 1176 (9th ed. 1983); *see also York Prods.*, 99 F.3d at 1573. In light of the specification and the prosecution history, the term “substantially” in the context of claim 1 is a term of approximation and retains its ordinary meaning. Thus, “substantially horizontally” should be construed as “largely, but not necessarily wholly, horizontal.” “Substantially vertically” should be construed as “largely, but not necessarily wholly, vertical.”⁴

We also note that the term “substantially” is a term of degree. Though a patentee need not define his invention with mathematical precision, the specification must provide “some standard

⁴ We add the word “necessarily” in our construction of the term “substantially” in order to accommodate the preferred embodiment of the fluid conveying arms that is wholly horizontal (Figs. 2, 5) and the preferred embodiment of the fluid riser inlet conduit that is wholly vertical. (Fig. 5.)

for measuring that degree.” *Enzo Biochem, Inc.*, 599 F.3d at 1332 (quoting *Seattle Box Co. v. Indus. Crating & Packing Co.*, 731 F.2d 818, 826 (Fed. Cir. 1984)). The parties do not dispute that one bound for measuring “substantially horizontally” is 0 degrees from horizontal, while one bound for measuring “substantially vertically” is 0 degrees from vertical. However, the parties disagree over how to measure the outer bound for “substantially horizontally” and “substantially vertically.” Shell argues that, in light of the specification and the prosecution history, “substantially horizontally” can include all angles up to 45 degrees from horizontal. Though Shell does not propose an outer bound for the term “substantially vertically,” the consistent use of the word “substantially” in both claim terms “substantially horizontally” and “substantially vertically” means that “substantially vertically” can include angles up to 45 degrees from vertical. Defendants argue that the specification provides no meaningful standard for measuring the angle of “substantially horizontal” fluid conveying arms or the angle of a “substantially vertically” fluid riser inlet conduit.

As an initial matter, we reject Shell’s proposed standard for measuring the term “substantially horizontally” as “horizontal to less than 45° from horizontal.” The specification provides a standard of measuring the arms by stating that they could be angled up to 60 degrees. However, during the prosecution history, Shell rejected this lexicography by amending its claim and inserting the term “substantially horizontal” in order to distinguish the fluid conveying arms in its patent from the arms in the Gilliam patent. At the time it amended its claim, Shell did not similarly amend the patent specification to include new lexicography that would have provided a specialized meaning to the term “substantially horizontally.” Thus, on the basis of the patent specification and prosecution history, we cannot conclude that the standard for measuring the degree of “substantially horizontally” is to include angles of up to 45 degrees.

However, we are not left without any standards for measure in the patent specification. As to one set of boundaries, the specification provides illustrations of the fluid conveying arms and the fluid riser inlet conduit in Figures 2 and 5 that are preferred embodiments of each as horizontal and vertical, respectively. As to the outer bounds of the angles of “substantially horizontally” and “substantially vertically,” we believe that a person of ordinary skill in the art would be able to interpret the claims in order to arrive at an acceptable range of angles. The patent specification instructs that the present invention relates to a process and corresponding apparatus for distributing fluid into a fluid mass such that the fluid “attain[s] uniform radial fluid distribution.” (col. 1 l. 8.) Claim 1 requires the fluid conveying arms to extend “substantially horizontally” outward from the vertical axis of the fluid riser inlet conduit. It also requires the fluid riser inlet conduit to be oriented substantially vertically along its longitudinal axis. As Defendants’ expert Dr. Zenz notes, uniform distribution of the fluid from the distribution points on the fluid conveying arms can be significantly altered by slight deviations of the fluid riser inlet conduit from a vertical position. (Zenz Decl. ¶ 11.) In addition, Dr. Zenz notes that the distribution points along the fluid conveying arms must have an equal height in the fluid mass in order to uniformly distribute the fluid into the fluid mass. (*Id.*) From the patent claims, the patent specification, and Dr. Zenz’s statements as a person with ordinary skill in the art, the fluid riser inlet conduit can only tilt away from its vertical axis up to a certain point. That certain point is where the fluid conveying arms no longer extend substantially horizontally outward from the vertical axis of the fluid riser inlet conduit. Moreover, the tilt of the fluid riser inlet conduit may not disturb the uniform distribution of the fluid from the fluid conveying arms, whatever the arms’ horizontal angle. Though we cannot provide a precise numerical limitation to the term “substantially,” we find that Defendants have not carried their burden of persuading us by clear

and convincing evidence that claims 1-4 of the 318 Patent are invalid for indefiniteness. *Enzo Biochem, Inc.*, 599 F.3d at 1335; *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984).

Therefore, we deny Defendants' motion for summary judgment on indefiniteness based on the term "substantially." We construe the term "substantially horizontally" as "largely, but not necessarily wholly, horizontal." We construe the term "substantially vertically" as "largely, but not necessarily wholly, vertical."

C. "ENCLOSED LENGTH" TERMS

Claim 1 recites the following language: **"the arms have an enclosed length and (c) having along said enclosed length one or more outlet openings at or near the end remote from the fluid riser inlet conduit."** (col. 7 ll. 18-21.) (emphasis added). Shell seeks to construe the term "enclosed length" as "the length of the arm which extends between the arm inlet and the distribution point in the fluid mass and which isolates the fluid being conveyed in the arm from the fluid mass until it reaches the distribution point." Defendants propose constructions for several terms within this language: "at or near" is indefinite; "enclosed length" means "enclosed from end to end"; "the arms have an enclosed length" means "the arms are fully enclosed from end to end"; "having along said enclosed length one or more outlet openings" means "having one or more outlet openings located wholly within the enclosed length of the arms"; and "the end remote from the fluid riser inlet conduit" means "the edge of the enclosed length of the fluid conveying arm farthest from the fluid riser inlet conduit."

1. "enclosed length"

Turning first to the claim itself, the term "enclosed length" is used to refer to a characteristic of the fluid conveying arms. The fluid conveying arms, in turn, have been

construed as the “conduits that convey fluid from the fluid riser inlet conduit to distribution points in the fluid mass.” The claim does not teach whether the arms must be enclosed from end to end, or must be enclosed only from the fluid riser inlet conduit to the distribution point.

The specification is illuminating. The specification distinguishes the present invention from prior art by noting that prior art was unable to uniformly distribute fluid among the fluid mass because of the open nature of the troughs and channels by which the fluid was distributed. The present invention’s innovation is to discharge the fluid from the arms “at specific points in the fluid mass” while “avoiding interaction between the bed and such points until the discharge point is reached.” (col. 2 ll. 21-23.) Thus the specification envisions arms that are enclosed, at the very least, from the fluid riser inlet conduit until the distribution point.

The specification also provides two specific embodiments for the fluid conveying arms. In the first embodiment, the fluid is distributed from an opening towards the end of the arm, such as in the base or side of the arm whereby the arm has a closed remote end. (col. 4 ll. 14-16.) In the second embodiment, the fluid is distributed from an opening *in* the remote end wall of the arm whereby it is clear that the arm is enclosed along its complete length. (col. 4 ll. 16-19.) These embodiments are illustrated in Figure 1. The embodiment whereby the arm has a closed remote end and the distribution points are located towards the end of the arm are illustrated by 4a and 5a. The embodiment whereby the arm has an opening in the remote end wall and is otherwise enclosed along its complete length is shown by 3a and 6a. We cannot accept Defendants’ construction of enclosed length as “enclosed from end to end” because it can simultaneously be interpreted as leaving one or the other of these embodiments out of the claim term. For example, if one interprets the phrase “enclosed from end to end” to mean that the remote end of the arm is open, then the first embodiment (wherein the distribution points are

located towards the end of the arm) would be excluded. Alternatively, if one interprets the phrase “enclosed from end to end” to mean that the remote end of the arm is closed, then the second embodiment (wherein the distribution points are located in the remote end of the arm) would be excluded. Any construction that excludes a preferred embodiment is rarely, if ever, correct. *See Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1581 (Fed. Cir. 1996). In addition, Defendants’ construction of “enclosed length” incorporates not only enclosure along the length of the arm, but also enclosure of the width of the arm at the end remote from the fluid conveying outlet. In other words, Defendants’ proposed construction requires a remote end wall. Claim 7, which is a dependent claim, imposes a limitation of a “closed remote end.” However, according to the doctrine of claim differentiation, limitations in the dependent claims give rise to the presumption that the broader independent claims are not confined to that range. *Am. Med. Sys. v. Biolitec, Inc.*, 618 F.3d 1354, 1360 (Fed. Cir. 2010). This presumption is supported by dependent claim 8, which teaches an outlet opening in the remote end wall. To construe “enclosed length” as “enclosed from end to end” would render claim 8 invalid.

We also decline to adopt Shell’s proposed construction in full because it adds some terms that we have not had occasion to construe. In addition, Shell’s proposed construction adds a function (“isolates the fluid”) to the term that it did not previously contain. Therefore, we construe the term “enclosed length” as “enclosed along the length extending from the fluid riser inlet conduit to the distribution point in the fluid mass.”

2. “the arms have an enclosed length”

Defendants’ proposed construction of this phrase as “fully enclosed from end to end” is rejected for the same reasons as we reject their construction of “enclosed length.” No construction of this phrase is necessary.

3. “having along said enclosed length one or more outlet openings”

Defendants’ proposed construction for this phrase as “having one or more outlet openings located wholly within the enclosed length of the arms” improperly limits the construction to a preferred embodiment. Defendants’ proposed construction limits independent claim 1 to the embodiment of dependent claim 7, wherein the remote end is closed. Defendants’ proposed construction also prevents independent claim 1 from encompassing the embodiment in dependent claim 8, wherein the arms are enclosed along their complete length and the outlet opening is located in the remote end wall. The patent specification and illustrations demonstrate the embodiment in Claim 8 that places the outlet opening *in* the end remote from the fluid riser inlet conduit, such that the outlet opening would not be located wholly within the enclosed length of the arms.

Placing the outlet opening in the end remote from the fluid riser inlet conduit is consistent with the outlet opening being “along” the enclosed length of the arms. “Along” is understood as both “over the length of” and “in a line parallel with the length or direction of or on a line through the center or central axis of.” *Webster’s Third New International Dictionary* at 60.

Finally, nothing in the prosecution history demonstrates that the inventors disclaimed outlet openings that were located in or at the remote end of the fluid conveying arms. In fact, the inventors amended Figure 1 to show an embodiment in fluid conveying arm (6) having an outlet opening (6a) at its remote end. (Doc. No. 90 at 76.) The inventors distinguished the prior art referenced as Bischoff by noting that Bischoff taught multiple outlets along the length of the distribution arms, while invention disclosed in their application only possessed outlets at the remote ends of the arms. (Doc. No. 90 at 77.) This discussion of Bischoff and the present

invention does not require that the outlet openings be contained wholly within the enclosed length of the fluid conveying arms.

Thus, we decline to adopt Defendants' proposed construction. No construction of this phrase is necessary.

4. "the end remote from the fluid riser inlet conduit"

We largely agree with Defendants that this phrase should be construed as "the edge of the enclosed length of the fluid conveying arm farthest from the fluid riser inlet conduit." However, we do not think the claim language itself, the specification, or the prosecution history require that the "edge" corresponding to "the end remote" be linked to the "enclosed length of the fluid conveying arm."

Turning first to the claim itself, the claim defines "an end remote" of a fluid conveying arm as the end remote from the fluid riser inlet conduit. (col. 7 ll. 14-15.) This antecedent phrase is necessary in order to understand the later appearance of "the end remote" in the phrase "having along said enclosed length one or more outlet openings at or near the end remote from the fluid riser inlet conduit." (col. 7 ll. 19-21.) The claim, therefore, teaches that the end remote of a fluid conveying arm is not the end that is closest to the fluid riser inlet conduit, but is actually the end that is away from the fluid riser inlet conduit. The claim does not explicitly require that the end remote be located at the edge of the arm's enclosed length. Neither does the claim explicitly require that the enclosed length terminate in the remote end of the fluid conveying arm.

The specification uses the phrase "remote end" to refer to the term "end remote" in claim 1. Notwithstanding the different order of words, the "remote end" is similarly used to refer to the end of the arm that is farthest away from the fluid riser inlet conduit. We do not think the

specification mandates that the end remote be at the edge of an “enclosed length,” merely that it be located at the edge of the fluid conveying arm.

Therefore, we construe “the end remote from the fluid riser inlet conduit” as “the edge of the fluid conveying arm farthest from the fluid riser inlet conduit.”

5. “at or near”

Defendants contend that the phrase “at or near” is vague and renders claims 1-4 of the 318 Patent indefinite. After a review of the claim language, the specification, and the prosecution history, we conclude that the Defendants have not met their burden in proving indefiniteness.

First, claim 1 teaches that the “outlet openings” are “at or near” the fluid conveying arm’s end remote from the fluid riser inlet conduit. The specification provides two embodiments, along with accompanying illustrations, of where the outlet openings can be located on the fluid conveying arms. In one embodiment, the outlet opening is “in the remote end wall,” which is consistent with the claim language providing for an outlet opening “at” the remote end. (col. 4 l. 17.) In the other embodiment, the outlet opening is “towards the end of a fluid conveying arm,” which is consistent with the claim language providing for an outlet opening “near” the remote end. (col. 4. ll. 14-15.) Though there is no precise numerical measurement provided in the specification to measure whether an outlet opening is “near” a remote end, the written description and illustrations show that the term “near” has been given its ordinary meaning of “at, within, or to a short distance.” *Webster’s Third New International Dictionary* at 1510; *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1349 (Fed. Cir. 2010). A person with ordinarily skill in the art can find guidance in the claim language and specification regarding where to place the outlet openings on the fluid conveying arms relative to the remote end of the arms.

Finally, the prosecution history does not establish that the term “near” is indefinite. It shows that claims 8-10 of the original application was rejected by the PTO as being anticipated by prior art referenced as Bischoff. (Doc. No. 90 at 87.) Bischoff taught an apparatus in which outlet openings were located along the length of the distribution arms and at the top of the fluid riser inlet conduit. The PTO specifically stated that claim 9 of the application (“The apparatus in claim 8 additionally having one or more outlet openings located on the fluid conduit.”) was anticipated by Bischoff fluid riser inlet conduit leading to each of the distribution arms. The PTO appears to have focused on the potential overlap between outlet openings in the fluid riser inlet conduit in the application, on one hand, and the outlet openings on Bischoff’s inlet conduit and distribution arms, on the other. In response, the inventors cancelled claim 9 and clarified that claim 8 of the application (which later became claim 1 of the 318 Patent) was distinguishable from Bischoff because the outlet or outlets of the present invention are only at the remote ends of the arms. (Doc. No. 90 at 77.) The inventors further clarified that Figure 1 depicted an embodiment in fluid conveying arm (6) wherein the outlet opening (6a) was located at its remote end. We interpret this history as disclaiming only the presence of several distribution points along the entire length of the fluid conveying arms, and any distribution points in the fluid riser inlet conduit.

Thus, we deny Defendants’ motion for summary judgment on indefiniteness based on the term “at or near.” We construe “at or near” as “at, within, or to a short distance.”

D. “RADIUS”-RELATED TERMS

1. “radially”

This term appears in claim 1. Shell seeks to construe the term as “along a radii from the axis of the fluid mass, or the fluid inlet location of the arms, to a distribution point in the fluid

mass.” Defendant does not believe that this term requires construction. If construction is required, Defendants propose that the plain meaning is “along a radius.” Shell contends that the claim term is given a specific construction within the specification, while Defendants argue that importing such a definition into the claim would render the claim language redundant.

Turning first to the claim itself, the term “radially” appears twice. First, the term “radially” describes the way in which the fluid conveying arms extend outward from the vertical axis of the fluid riser inlet conduit. Second, the term “radially” describes the way in which the fluid conveying arms extend into the fluid mass. Nothing in the claim language itself requires the Shell’s proposed limitation that the arms extend “to a distribution point in the fluid mass.”

Turning next to the specification, the term “radially” is defined as “radii about the axis of the fluid mass or about a single fluid inlet location from which fluid is conveyed to distribution points.” (col. 3 ll. 21-23.) Both parties agree that this definition incorporates the ordinary meaning of “radially” as along a radius or radii. However, they part ways at the next step. Shell argues that the definition also requires that the radius be measured in relation to one of two axes—either the axis of the fluid mass or the axis of the fluid inlet location. A patentee may act as her own lexicographer in redefining the meaning of claim terms away from their ordinary meaning as long as the intent to do so is clearly expressed in the written description. *Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1370 (Fed. Cir. 2005). In the present case, the inventors of the 318 Patent clearly indicated that they wished to redefine “radially” to include not only the ordinary meaning of “along a radius,” but also a requirement that the radius be measured about two specific points within the regenerator vessel. Inserting this definition into the claim does not make the claim language redundant. Rather, the definition provides one of two alternatives for how a person of ordinary skill in the art can interpret the word “radially.”

The claim provides the guidance for which of these two alternatives will apply in a given circumstance.

However, the definition of “radially” in the specification says nothing about the distribution points being located “in the fluid mass.” We decline to adopt that portion of Shell’s proposed construction. Therefore, we construe the term “radially” as “along radii about the axis of the fluid mass or about a single fluid inlet location from which fluid is conveyed to distribution points.”

2. “radial distribution of fluid into a fluid mass”

This phrase appears in claim 1. Shell seeks to construe this phrase as “discharging fluid into a fluid mass at a discrete distribution point located within the fluid mass on a radii about the axis of the fluid mass.” Defendants seek to construe this phrase as “distributing fluid into a fluid mass along a radius.” The parties agree that the term should be construed as “discharging [or distributing] fluid into a fluid mass along a radius.” However, Defendant objects to Shell’s proposed construction as introducing unnecessary verbiage that is already provided for in the claim itself.

Turning first to the claim, the claim teaches an “apparatus for radial distribution of fluid into a fluid mass” that comprises, among other things, fluid conveying arms that extend radially from the axis of the fluid riser inlet conduit *and* extend radially into the fluid mass. We have already construed the term “fluid conveying arms” as “conduits that convey fluid from the fluid riser inlet conduit to distribution points in the fluid mass.” From the claim itself and our construction of “fluid conveying arms,” it is clear that the distribution points extend radially from the *axis of the fluid riser inlet conduit*. However, neither the claim itself nor our construction of the term “fluid conveying arms” require the distribution points to be arranged

radially around the *axis of the fluid mass*. In addition, our construction of the term “radially” as “along radii about the axis of the fluid mass or about a single fluid inlet location from which fluid is conveyed to distribution points” does not require that the distribution points be located along radii about the *axis of the fluid mass*. Therefore, the claim itself does not require that “radial distribution of fluid into a fluid mass” occur along radii about the axis of the fluid mass.

The specification confirms this conclusion. In it, the fluid riser inlet conduit, a preferred embodiment, is described as preferably located “substantially coaxially with the fluid mass but may be acentrically located in a such a manner that the distributor arm outlets are regularly arranged in the fluid mass to ensure radial uniformity of outlet.” (col. 4 ll. 43-47.) Our construction of the term “fluid conveying arms” and claim 1 itself requires that the distribution points be located along a radius about the axis of the fluid riser inlet conduit. When the fluid riser inlet conduit is located coaxially with the fluid mass, then the distribution points will also be located along a radius about the axis of the fluid mass. However, when the fluid riser inlet conduit is located acentrically, the distribution points will not be located along a radius about the axis of the fluid mass. Although a preferred embodiment instructs that the distribution points be arranged along a radius about the axis of the fluid riser inlet conduit *and* along a radius about the axis of the fluid mass, we decline to use the preferred embodiment to limit the claim language. *See Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1381 (Fed. Cir. 2009) (“[P]articular embodiments appearing in the written description will not be used to limit claim language that has broader effect.” (omitting citation)).

We also agree with Defendants that Shell’s proposed construction including both the phrases “into a fluid mass” and “within the fluid mass” are redundant. We will choose the phrase “within the fluid mass” for the same reason that we choose to include the phrase “at a discrete

distribution point” in our construction of this term. The process for the “radial distribution of fluid into a fluid mass” is described in the “Summary of the Invention” section of the specification as discharging fluid “via plurality of distribution points located radially in the fluid mass.” (col. 2 ll. 35-36.) Similarly, the “Background of the Invention” describes the innovation of the present invention as keeping the fluid contained within the fluid conveying arms separate from the fluid mass until the fluid reaches “specific points in the fluid mass.” (col. 2 l. 21.) The specification instructs, then, that key to the process and apparatus for radial distribution of fluid into a fluid mass are distribution points within the fluid mass.

Therefore, we construe the term “radial distribution of fluid into a fluid mass” as “discharging fluid at a distribution point located within the fluid mass along a radius.”

3. “radius of the fluid mass”

This language appears in claim 2: “The apparatus according to claim 1 wherein said fluid conveying arms have a length of at least one quarter of the radius of the fluid mass.” (col. 7 ll. 22-24.) Shell does not believe any construction of the term is needed. Defendants seek to construe this term as “one-half the diameter of the vessel measured at the level of the fluid conveying arms.” Defendants rely on extrinsic evidence, including dictionary definitions and the declaration of their expert, Dr. Frederick Zenz, as support for their proposed construction. Shell contends that there is no intrinsic support for Defendants’ proposed construction. In addition, Shell notes that, if one adopts a construction of the term “fluid mass” as “fluid bed,” the term “radius of the fluid mass” would be understood as “radius of the fluid bed,” which is straightforward.

Turning first to the claims themselves, nothing in the claims instructs whether the “radius of the fluid mass” should be measured at the level of the fluid conveying arms or at some other

level within the vessel. Turning next to the specification, it teaches that, in a preferred embodiment of the invention, “fluid is discharged at a distance of at least one quarter of the radius of the fluid mass from the fluid mass axis, more preferably at a distance of at least 1/10 of the radius, for example substantially one half of the radius.” (col. 2 ll. 57-60.) However, this language does not provide guidance as to which level of the fluid mass within the vessel should be measured in order to determine the radius of the fluid mass. Neither does the specification teach whether the vessel, which “may be of any cross-sectional geometry, such as circular, square, and is preferably circular,” maintains the same diameter from the bottom to the top of the vessel. (col. 3 ll. 5-7.)

Defendants propose that we look to extrinsic evidence to construe this term. The idea that fluid takes the shape of its container and that a container may have varying diameters is unobjectionable. Neither do we disagree with the conclusion that the “radius of a fluid mass,” therefore, depends on the radius of the vessel in which it is contained. However, Defendants do not cite adequate support for their next proposition—that a person having ordinary skill in the art would understand that the “radius of the fluid mass” is measured at the level of the fluid conveying arms. Defendants proffer the expert declaration of Dr. Zenz, who states that he considers himself to be a person of ordinary skill in the art as of the early 1990s. (Zenz Decl. ¶ 6.) He goes on to state, with respect to the present term, that it would be understood as being measured at the level of the arms conducting the fluid mass. Dr. Zenz does not cite to the intrinsic evidence or to other independent or industry sources for support for this construction. He does not draw upon his own experience in the art to explain why he believes this construction would be apparent to a person with ordinary skill in the art. We will not rely on Dr. Zenz’s expert declaration to construe this term. *See Network Commerce, Inc. v. Microsoft Corp.*, 422

F.3d 1353, 1361 (Fed. Cir. 2005) (“[C]onclusory, unsupported assertions by experts as to the definition of a claim term are not useful to a court.” (quoting *Phillips*, 415 F.3d at 1318)).

Defendants’ failure to propose an appropriate construction for this term does not cause us to revisit our prior construction of the term “fluid mass” as “fluid contained within the vessel.” Even if we had construed the term “fluid mass” as “fluid bed,” as Shell proposed, this construction would not prove helpful. The illustration of a fluid bed shown in Shell’s claim construction brief and Defendants’ technology tutorial suggests that a fluid bed comprises an area of some depth within the vessel. In addition, the illustrations in Defendants’ technology tutorial suggest that there are regenerator vessels that expand in diameter from bottom to top and vice versa. Taken together, these illustrations indicate that there may be circumstances in which the fluid bed contained in the regenerator vessel possesses varying diameters when measured at different levels of the vessel. However, like “fluid mass,” the specification provides no guidance as to the level at which the radius of a fluid bed should be measured for purposes of claim 2.

Therefore, we decline to adopt a construction of the term “radius of the fluid mass” at this time.

E. MEANS-PLUS-FUNCTION LIMITATIONS

The parties agree that asserted claims 3 and 4 each contain means-plus-function limitations that should be construed under 35 U.S.C. § 112¶6:

3. The apparatus according to claim 1 further comprising means for dissipating kinetic energy of the fluid as the fluid is discharged at each outlet opening.
4. The apparatus according to claim 3 wherein said kinetic energy dissipating means comprises impact or expansion means.

- 1. “means for dissipating kinetic energy of the fluid as the fluid is discharged at each outlet opening”**

We agree with the parties' assertion that claim 3 contains a means-plus-function limitation that should be construed under 35 U.S.C. § 112¶6. *See Callicrate v. Wadsworth Mfg. Co.*, 427 F.3d 1361, 1368 (Fed. Cir. 2005) (the appearance of the word "means" in a claim element in association with a function creates a rebuttable presumption that § 112¶6 applies).

We turn next to the function of this claim term. The parties agree that the recited function is "dissipating the kinetic energy of the fluid as the fluid is discharged at each outlet opening." We find this function appropriate because it has been identified solely based on the claim language rather than in reference to an embodiment in the specification. *See JVW Enters., Inc. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1330 (Fed. Cir. 2005).

The next step is to identify the corresponding structure in the specification. Shell seeks to construe the corresponding structure as "A surface located in the fluid stream path, including splash plates, impact baffles, the structures shown in Figs. 1, 2, and 4, and/or arm configurations with increasing cross-sectional area in radial direction, arm outlets that are horizontally elongated in cross-sectional area, fluid permeable packing located at a fluid distribution point, and their equivalents." Defendants seek to construe the corresponding structure as "(1) splash plates having two impact faces (8) as illustrated in Figs 2 and 4; (2) impact baffles both of which are (a) supported on the fluid-conveying arm or on the regenerator wall, (b) arranged to an angle of 90 to 165 degrees to fluid stream flow, (c) mono or multiplanar, or of pyramidal configuration, or comprise a curved face or faces providing a gradually lessening degree of impact. Faces of a multiplanar impact means are directed away from each other; (3) structured fluid-permeable packing provided at or downstream of the distribution point; (4) if along the enclosed length of the fluid conveying arms, arm outlets that are horizontally elongated in cross-

sectional area; and equivalents thereof.” The parties both focus on the structures contained in the specification, but each attempt to exclude certain structures from their proposed construction.

In the specification, the “means for dissipating the fluid kinetic energy” are preferably “impact or expansion means.” (col. 3 ll. 50-51.) Impact means are defined as means associated with the outlet opening on the arms whereby fluid exiting the outlet opening impacts thereon. (col. 3 ll. 52-54.) The structures associated with impact means are “an impact face located in the fluid stream path,” “splash plates and impact baffles which provide an impact face or faces to the distributed fluid,” “splash plates and impact baffles that are arranged at such an angle to the fluids stream that an impact surface is presented to the fluids stream,” “mono or multiplanar or may be of pyramidal configuration or even comprise a curved face or faces providing a gradually lessening degree of impact,” and “faces of a multiplanar impact means are directed away from each other.” (col. 3 l. 51-col. 4 l. 12.) We construe the structure associated with impact means to include all of these structures. *See Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999), *reversed and vacated on other grounds by*, 318 F.3d 119 (Fed. Cir. 2003) (“When multiple embodiments in the specification correspond to the claimed function, proper application of § 112, P 6 generally reads the claim element to embrace each of those embodiments.”). We decline to limit the impact means to splash plates that have two impact faces, to impact baffles that are supported on the fluid conveying arms or on the regenerator wall, or to impact baffles that are arranged at an angle of 90 to 165 degrees to the stream flow because these are all preferred embodiments. *See Callicrate*, 427 F.3d at 1369 (proper construction should account for “all structure in the specification corresponding to the claimed function,” not just the preferred embodiments).

Expansion means are defined in the specification as means for expanding the fluid volume. (col. 3 ll. 58-59.) One structure associated with expansion means is “fluid conveying arms of increasing cross-sectional area in radial direction.” (col. 3 ll. 59-62.) The specification alternatively describes a structure for expansion as “an arm configuration providing an increasing cross sectional area in radial direction,” which we believe to be broader than “fluid conveying arms of increasing cross-sectional area in radial direction.” (col. 4 ll. 34-35.) We will adopt the broader structure.

The next sentence, “The arm outlets may be somewhat horizontally elongate in cross section to limit the vertical distribution of fluid,” appears to be a particular embodiment of the “arms of increasing cross-sectional area” rather than a separate structure associated with expansion means. Alternatively, “horizontally elongate” arm outlets are associated with the function of “limit[ing] the vertical distribution of fluid,” and not with the function of dissipating the kinetic energy of fluid. “Structural features that do not actually perform the recited function do not constitute corresponding structure and thus do not serve as claim limitations.” *Asyst Techs., Inc. v. Empak, Inc.*, 268 F.3d 1364, 1370 (Fed. Cir. 2001). Therefore, we will not consider this a separate structure for expansion means.

Another structure in the specification is “fluid-permeable packing provided at or downstream of the distribution point.” (col. 3 ll. 59-62.) Later the specification describes “structured fluid-permeable packing located at a fluid distribution point” as a structure for expansion. However, we believe the latter structure to be a more restrictive structure than the former and choose the former as the broader construction. We do not think that the specification’s language that expansion means suitably “comprise known fluid expander configurations located at i.e., fixedly attached to, or integral with the outlet of the fluid

conveying arms” correspond to a structure. (col. 4 ll. 31-33.) Rather, this text is functional language rather than physical structure. *See Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus.*, 145 F.3d 1303, 1308 (Fed. Cir. 1998).

Finally, the drawing in Figure 1 illustrates an expansion means in the form of the increased cross-sectional end. (col. 5 ll. 59-60.) The drawing in Figure 2 illustrates an impact means in the form of splash plates. (col. 6 ll. 21-22, 33-35.) The drawing in Figure 4 illustrates an impact means in the form of a splash plate that has two impact faces and is suspended from a support member. (col. 6 ll. 46-47.) We will incorporate the structures shown in these Figures into our construction of the structure associated with the means in claim 3. *See Playtex Prods., Inc. v. Procter & Gamble Co.*, 400 F.3d 901, 909 (Fed. Cir. 2005) (identifying the corresponding structure for a means-plus-function limitation requires the court to examine the drawings and abstract in the patent’s written description).

Therefore, we construe the corresponding structure to the function in this claim term as: “(1) an impact face located in the fluid stream path; (2) splash plates and impact baffles which provide an impact face or faces to the distributed fluid; (3) splash plates and impact baffles that are arranged at such an angle to the fluids stream that an impact surface is presented to the fluids stream; (4) structures that are mono or multiplanar or may be of pyramidal configuration or even comprise a curved face or faces providing a gradually lessening degree of impact. Faces of a multiplanar impact means are directed away from each other; (5) arm configurations providing an increasing cross sectional area in radial direction; (6) fluid-permeable packing provided at or downstream of the distribution point; (7) the increased cross-sectional arm end as illustrated in Fig. 1; (8) splash plates as illustrated in Fig. 2; (9) a splash plate having two impact faces and suspended from a support member as illustrated in Fig. 4; or their equivalents.”

2. “impact or expansion means”

Both parties agree that this phrase in claim 4 is a means-plus-function limitation that should be construed under § 112¶6. The Court concurs. *See Callicrate*, 427 F.3d at 1368.

We next identify the function of this limitation. Shell seeks to construe “expansion means” as “expanding the fluid volume as the fluid is discharged.” Shell does not believe that it is necessary to identify the function of the claim term “impact,” but if the Court decides that “impact” should be included in the construction, proposes a slightly modified function of “impacting the discharged fluid and/or expanding the fluid volume as the fluid is discharged at each outlet opening.” Defendants seek to construe “impact or expansion means” as “impact or expansion.” We decline to adopt Shell’s proposed constructions because they improperly reference embodiments within the specification (“expanding the fluid volume”) rather than focusing solely on the claim language itself. *See JVW Enters., Inc.*, 424 F.3d at 1330. Rather, we adopt Defendants’ proposed function with a modification. We add the phrase “as the fluid is discharged at each outlet opening,” which appears in claim 3. As claim 4 is dependent on claim 3, it includes all of claim 3’s limitations. *See* 35 U.S.C. § 112¶4. Therefore, we construe the function of this claim as “impact or expansion as the fluid is discharged at each outlet opening.”

We turn next to the structure associated with this function. Shell proposes a structure that focuses only on the specification’s description of “expansion means.” Defendants propose the same structure as they proposed for claim 3. As described in the prior section, the specification outlines several structures associated with “impact means” and “expansion means.” We have construed the structure in claim 3 broadly to include these structures. We see no reason to depart from our prior construction of the structures associated with “impact means” and “expansion means.” Therefore, we construe “impact or expansion means” as: “(1) an impact face located in

the fluid stream path; (2) splash plates and impact baffles which provide an impact face or faces to the distributed fluid; (3) splash plates and impact baffles that are arranged at such an angle to the fluids stream that an impact surface is presented to the fluids stream; (4) structures that are mono or multiplanar or may be of pyramidal configuration or even comprise a curved face or faces providing a gradually lessening degree of impact. Faces of a multiplanar impact means are directed away from each other; (5) arm configurations providing an increasing cross sectional area in radial direction; (6) fluid-permeable packing provided at or downstream of the distribution point; (7) the increased cross-sectional arm end as illustrated in Fig. 1; (8) splash plates as illustrated in Fig. 2; (9) a splash plate having two impact faces and suspended from a support member as illustrated in Fig. 4; or their equivalents.”

F. AGREED CONSTRUCTIONS

The parties submitted agreed constructions for certain additional phrases from the patents-in-suit as follows:

1. “fluid”

This term will be construed as “a liquid, gas or a mixture of fluidizing gas and finely divided solids maintained in fluidized form by the fluidizing gas.”

2. “means for dissipating kinetic energy of the fluid as the fluid is discharged at each outlet opening”

The parties agree that this is a means-plus-function limitation and that the recited function is “dissipating the kinetic energy of the fluid as the fluid is discharged at each outlet opening.”

IV. CONCLUSION

In accordance with the analysis set forth in this Memorandum, the Court hereby construes the terms and phrases from the patent-in-suit as follows:

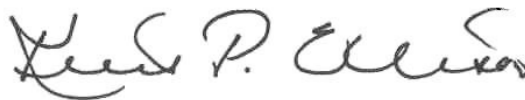
CLAIM TERM	COURT'S CONSTRUCTION
horizontal	parallel to the horizon
"vertical"	perpendicular to the plane of the horizon
"fluid"	a liquid, gas or a mixture of fluidizing gas and finely divided solids maintained in fluidized form by the fluidizing gas
"radial distribution of fluid into a fluid mass"	discharging fluid at a distribution point located within the fluid mass along a radius
"fluid mass"	Fluid contained within the vessel
"fluid riser inlet conduit"	conduit for the introduction of fluid into the fluid mass through the fluid conveying arms
"substantially vertically"	largely, but not necessarily wholly, vertical
"fluid conveying arms"	conduits that convey fluid from the fluid riser inlet conduit to distribution points in the fluid mass
"substantially horizontally"	largely, but not necessarily wholly, horizontal
"radially"	along radii about the axis of the fluid mass or about a single fluid inlet location from which fluid is conveyed to distribution points
"enclosed length"	enclosed along the length extending from the fluid riser inlet conduit to the distribution point in the fluid mass
"the arms have enclosed length"	No construction necessary
"having along said enclosed length one or more outlet openings"	No construction necessary
"the end remote from the fluid riser inlet conduit"	the edge of the fluid conveying arm farthest from the fluid riser inlet conduit
"at or near"	at, within, or to a short distance
"radius of the fluid mass"	No construction necessary
"means for dissipating the kinetic energy of the fluid as the fluid is discharged at each outlet opening"	<p>Function: dissipating the kinetic energy of the fluid as the fluid is discharged at each outlet opening</p> <p>Structure: (1) an impact face located in the fluid stream path; (2) splash plates and impact baffles which provide an impact face or faces to the distributed fluid; (3) splash plates and impact baffles that are arranged at such an angle to the fluids stream that an impact surface is presented to the fluids stream; (4) structures that are mono or multiplanar or may be of pyramidal configuration or even comprise a curved face or faces providing a gradually lessening degree of impact. Faces of a multiplanar impact means are directed away from each other; (5) arm configurations providing an increasing cross sectional area in radial direction;</p>

	(6) fluid-permeable packing provided at or downstream of the distribution point; (7) the increased cross-sectional arm end as illustrated in Fig. 1; (8) splash plates as illustrated in Fig. 2; (9) a splash plate having two impact faces and suspended from a support member as illustrated in Fig. 4; or their equivalents.
“impact or expansion means”	<p>Function: impact or expansion as the fluid is discharged at each outlet opening</p> <p>Structure: (1) an impact face located in the fluid stream path; (2) splash plates and impact baffles which provide an impact face or faces to the distributed fluid; (3) splash plates and impact baffles that are arranged at such an angle to the fluids stream that an impact surface is presented to the fluids stream; (4) structures that are mono or multiplanar or may be of pyramidal configuration or even comprise a curved face or faces providing a gradually lessening degree of impact. Faces of a multiplanar impact means are directed away from each other; (5) arm configurations providing an increasing cross sectional area in radial direction; (6) fluid-permeable packing provided at or downstream of the distribution point; (7) the increased cross-sectional arm end as illustrated in Fig. 1; (8) splash plates as illustrated in Fig. 2; (9) a splash plate having two impact faces and suspended from a support member as illustrated in Fig. 4; or their equivalents.</p>

Defendants’ Motion for Summary Judgment on Equitable Estoppel and Laches (Doc. No. 58) is **DENIED**. Defendants’ Motion for Summary Judgment on Indefiniteness (Doc. No. 50) is **DENIED**. Defendants’ Motion to Exclude Expert Testimony of Ye-Mon Chen (Doc. No. 87) is **DENIED AS MOOT**.

IT IS SO ORDERED.

SIGNED in Houston, Texas this the 21st day of March, 2011.



KEITH P. ELLISON
UNITED STATES DISTRICT JUDGE